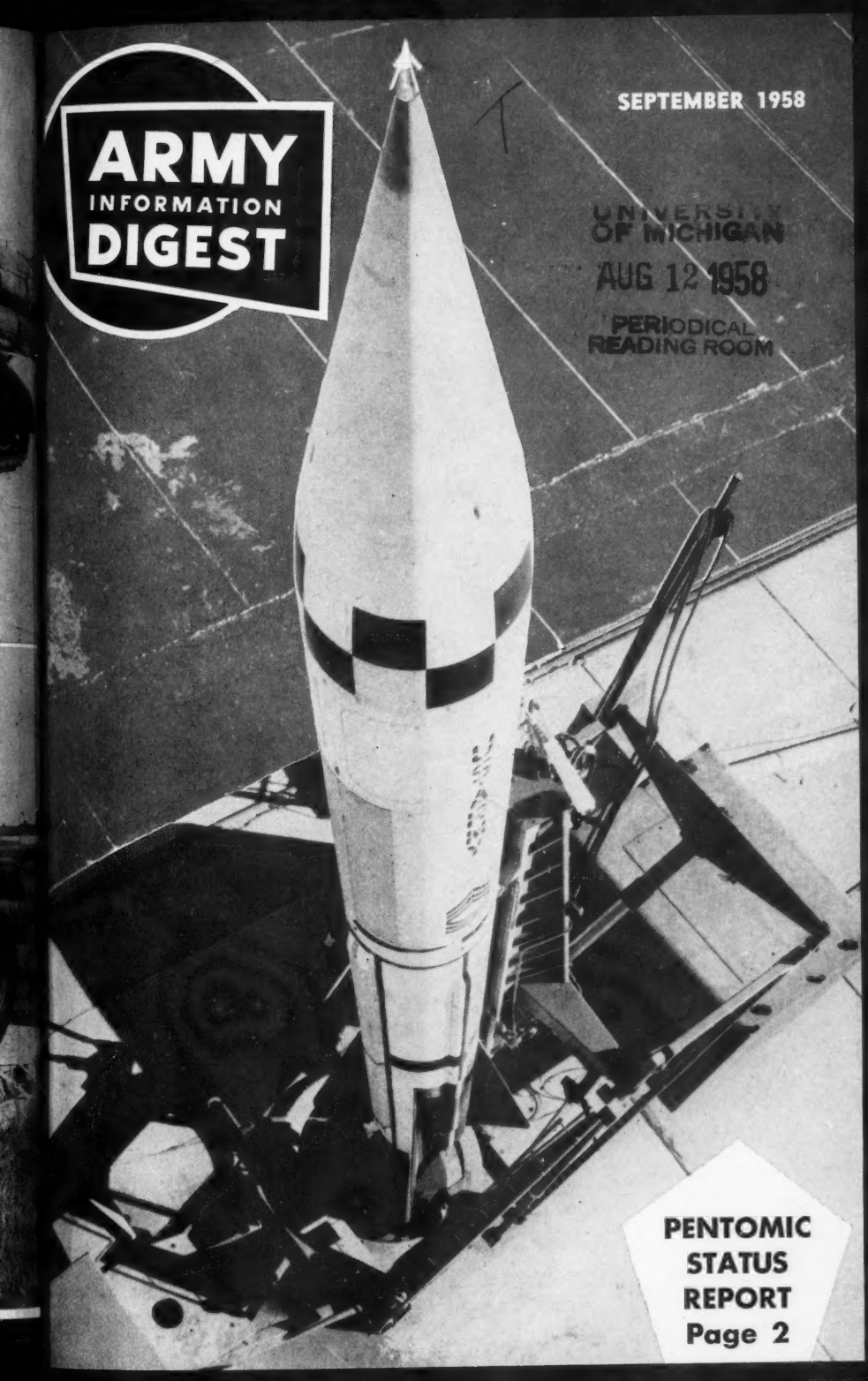

ARMY INFORMATION DIGEST

SEPTEMBER 1958

PENTOMIC STATUS REPORT
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THE OFFICIAL U. S. ARMY MAGAZINE

ARMY INFORMATION DIGEST

THE OFFICIAL MAGAZINE of the DEPARTMENT OF THE ARMY

The mission of ARMY INFORMATION DIGEST is to keep personnel of the Army aware of trends and developments of professional concern.

THE DIGEST is published under supervision of the Army Chief of Information to provide timely and authoritative information on policies, plans, operations, and technical developments of the Department of the Army to the Active Army, Army National Guard, and Army Reserve. It also serves as a vehicle for timely expression of the views of the Secretary of the Army and the Chief of Staff and assists in the achievement of information objectives of the Army.

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Use of funds for printing this publication has been approved by Director, Bureau of the Budget, 8 May 1957.

Manuscripts on subjects of general interest to Army personnel are invited. Direct communication is authorized to: The Editor, ARMY INFORMATION DIGEST, Cameron Station, Alexandria, Va. Unless otherwise indicated, material in the DIGEST may be reprinted provided credit is given to the DIGEST and to the author.

VIEWED FROM ANY ANGLE, the Sergeant ground-to-ground ballistic missile on front cover incorporates improvements in power, range and reliability over its predecessor, the Corporal. With a highly accurate guidance system invulnerable to any known enemy countermeasures, the 30-foot Sergeant can be transported, emplaced and fired by a small crew.

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NG & USAR: Same as Active Army except allowance is one copy to each unit. For explanation of abbreviations used, see AR 320-50.

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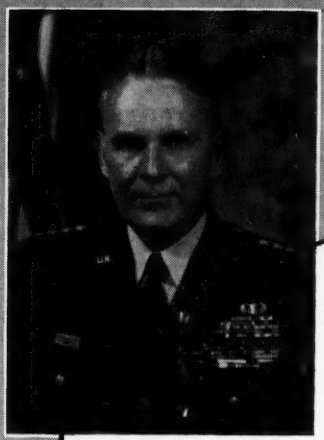


On the Army's modernization needs—

FOREWORD

I wish to invite attention to the article in this issue of the ARMY INFORMATION DIGEST prepared by the former Deputy Chief of Staff for Military Operations. I urge each member of the Army to bend his thoughts and efforts to the solution of the problems discussed therein.

The Army has been making great forward strides in advancing its concepts, its organizations, and its weapons systems. However, this progress has not been uniform or free of interruption. Our concepts sometimes have outrun our equipment capabilities, but this situation is a proper one since otherwise our materiel programs would suffer for lack of proper guidance.

I have followed the reorganization of our divisions along pentomic lines with the keenest interest. On all sides, I sense the enthusiasm of our officers over the possibilities and the challenges posed by this new structure. I hope that this enthusiasm will never diminish but will occasion continuous creative thought directed at improving the effectiveness of these new divisions.

At the same time I am aware of the possible discouragement which may arise from the absence of the complete equipment required by these organizations. We should not forget that this shortage was anticipated at the time of the conversions of our divisions but was accepted as being preferable to further delay in reorganization. I am sure that this attitude was thoroughly justified.

The task of modernizing the equipment of the Army is now the most important one before us. The Army Staff has the responsibility for presenting the needs of the Army for modern equipment here at the seat of government. At the same time there is a responsibility for every officer and soldier to show a maximum of ingenuity in adapting what we have to our requirements.

Concurrently, we should establish by practical tests and experiments the essential requirements in weapons to derive the most of our new organizational structure. Many of our views on this subject have been based upon theoretical considerations; now is the time to verify that our conclusions are sound.

The modernization of the Army is a continuous process which must move forward steadily toward clearly conceived goals. It is important that all of us who are responsible for the well-being of the Army assure, through continuous reappraisal, that our goals are the right ones and that we are employing the best and most practical means for reaching them in the shortest possible time.

Maxwell D. Taylor

MAXWELL D. TAYLOR
General, United States Army
Chief of Staff

THE PENTOMIC REORGANIZATION — A STATUS REPORT

LIEUTENANT GENERAL C. D. EDDLEMAN

MORE THAN a year has elapsed since the Army started its conversion to the Pentomic organization. The tactical concepts upon which that organization is based are now generally integrated into the Army school and training system and into the operational planning of deployed Army forces throughout the world. Even so, the entire Army is now evolving, evaluating, and adopting further improvements in both the new organization and the new tactics. This is as it should be, for we are in a period of continuing change.

These comments are being published to focus attention on some of the more pressing problems which must be solved if the Army is to accomplish its modernization at the proper rate. Our primary concern is with our divisions and those elements which directly support them. Even though these remarks are not fixed to any rigid period of time, it is important to keep the time factor in mind because it places limits on the materiel with which we and our potential enemies will be equipped.

THE Pentomic reorganization is the beginning rather than the end of the Army's adaptation to the nuclear battlefield and to the increasingly complicated military situations which the Army may expect to face. While the decision to reorganize was a high-level one, the evaluation of the new organizations must come from the troop units and headquarters up and down the chain of command as they verify by operational tests and

LIEUTENANT GENERAL C. D. EDDLEMAN, who recently assumed command of Seventh U. S. Army in Germany, was Deputy Chief of Staff for Military Operations, Department of the Army, during initial stages of the Army conversion to Pentomic organization.

"The Pentomic reorganization is the beginning rather than the end of the Army's adaptation to the nuclear battlefield and to the increasingly complicated military situations which the Army may be expected to face."

actual practice the workability of the concepts, the tactics, and the organizations.

This process is one in which all Army personnel must participate. During our review and evaluation we must keep one foot firmly on the ground, but the other must be swinging into the future.

As we review our progress we must be careful not to belittle our difficulties or bury them under a mask of oversimplifications. We can never expect to overcome the problems which remain before us unless we face them, define them carefully, and attack them directly. On the other hand, we must not rely on the lessons of history to an undue degree, for much of what we are doing and will do in the future has no precedent.

THE main problem of the Army is that of meeting the nuclear challenge, both as it relates to our use of such weapons and as it relates to our vulnerability to nuclear weapons in the hands of the enemy. This challenge is becoming more and more acute due to continuing increases in the numbers and yields of weapons and the rapid development of modern missiles to deliver them.

Possession by the enemy of these highly destructive weapons has caused the Army to develop organizations and tactics which will reduce the vulnerability of its operating forces. There are three principal methods by which Army forces can reduce their vulnerability to nuclear weapons:

- *First,* by *dispersion* into formations smaller than those considered to be lucrative atomic targets. Dispersion must be coupled with other passive measures designed to reduce the susceptibility of our forces to detection, such as concealment and camouflage.
- *Second,* by *mobility* so that the enemy would be presented only with fleeting targets.
- *Third,* by *physical protection* against heat, blast and radiation, including the use of armored fighting vehicles and carriers.

The Pentomic concept embraces all of these methods; however, we must recognize that our current capabilities with weapons and equipment on hand do not permit us to enjoy the full benefits of the new concept. Figuratively speaking, there is a gap between our more advanced concepts and our present capabilities. It is to the closing of this gap that we should direct our attention.

PROBLEMS OF DISPERSION

DISPERSION of the type required in active atomic warfare is not an unmixed military virtue—it is, however, a necessity. Concentration, not dispersion, has always been the principal technique by which combat power has been used to achieve decisive results—the principle of mass, if you wish to call it that. Dispersion general-

ly dissipates strength and combat power and renders infinitely more difficult the conduct of effective operations, both tactical and logistical.

Additionally, there is a level below which units cannot be fragmented and still survive on the battlefield. This level will fluctuate with local conditions and may well sink lower in the future; however, it will always be determined largely by the interaction of two factors. The first is the size and nature of the enemy's tactical nuclear stockpile, as well as the efficiency of his delivery means and his ability to find targets. The second is the ability of the small independent tactical groupings to survive and execute their missions.

Theoretically, at least, the amount of dispersion required would be determined largely by the willingness and ability of the enemy to expend his tactical nuclear stockpile on ever smaller targets. Theoretically, again, one of the techniques of nuclear war would seem to be to drive one's opponent to disperse into such small units that these units could not survive in the local environment of conventional arms, or at least so small that they could perform no useful task.

THERE is no alternative to a dispersed posture in an atomic environment. The degree of dispersion will vary; however, undue concentration must be avoided at all costs. Our problem, then, is to provide the tactics, techniques, fire support, mobility, control, weapons and equipment to make the philosophy of dispersed warfare fully effective. In doing so, it is essential that we consider not only the organic means of the small dispersed tactical groupings, but also those reinforcing and supporting elements available to them from higher echelons. The combat power of any unit is much greater than the power of its organic means. This is particularly true in our Pentomic organizations, due to extended use of the pooling concept.

"Figuratively speaking, there is a gap between our more advanced concepts and our present capabilities. It is to the closing of this gap that we should direct our attention."

MOBILITY NEEDS

AT this point the second factor comes into play—that is, the necessity for ever smaller units to possess greater mobility and firepower.

Mobility has always been a military asset, but never more than today when it has been called to the center of the stage, not only on its own merits, but also as an antidote to dispersion.

It has been recognized for some time that a force fully equipped with nuclear weapons could force its opposition into a degree of dispersion largely incompatible with the execution of traditional missions in a manner associated with past wars. Therefore, it has been recognized that the design of forces must change.

In addition, it has been recognized that it may be necessary to bring together two or more of the small dispersed formations to produce the necessary "mass" of conventional and small nuclear weapons to attack, block, or counterattack effectively. Each basic combat element must be capable of moving to concentrate with other such forces when required, executing rapidly an assigned mission, and returning to dispersal and concealment before the enemy can retaliate with his nuclear weapons. This sequence calls for a high degree of battlefield mobility; however, this is not a simple objective to attain.

THERE are several prerequisites to mobility on the nuclear battlefield:

- *First,* ground and air vehicles of advanced design, in proper proportion.
- *Second,* forces able to use each form of movement, including foot movement at times, in that environment to which it is best suited.
- *Third,* mobile firepower, both atomic and conventional, at all echelons, sufficiently powerful, accurate and responsive so that dispersed formations can move literally at will through enemy infested terrain.
- *Fourth,* specialized, air mobile forces for reconnaisance and security.
- *Fifth,* command mobility in terms of adequate communications and imaginative tactics.
- *Sixth,* a logistics system which can survive and operate effectively on the nuclear battlefield.

WITH respect to vehicles, there has been some misunderstanding regarding the significance of the fact that the infantry and airborne divisions do not have tracked or wheeled mobility for all of their combat echelons. This is not a decision *against* vehicles or against tactical mobility; rather, it is a decision *for* strategic mobility and for logistical feasibility. This is simply another case of a gap between what we want and what we can get at the moment.

The full development of the Pentomic concept is incompatible with foot speeds. Therefore, we must have vehicles, both ground and air. Because we also must have strategic mobility, our task is clear. We must develop ground and air vehicles of types which can be moved economically by air. There are no insuperable obstacles in this direction and this gap should be closed in due course.

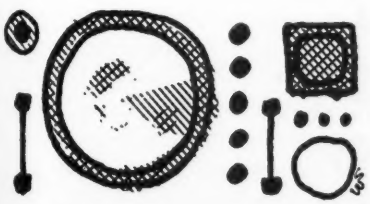
Next, there is the question of mobile firepower—atomic and conventional. We must accept as a permanent feature of modern war the necessity for Army forces to disperse into relatively small combat formations operating semi-independently. Our problem is to invest these formations with sufficient combat power so that they can survive and operate.

However, the pattern of development and support of these units must be such that when they are confronted with tasks which exceed their organic capabilities, they can call for and receive rapidly appropriate combat support from adjacent and higher units. Otherwise, they could be neutralized, isolated, and destroyed selectively by an alert and imaginative enemy. Our concepts do not and must not anticipate habitual loss of control by higher units or complete loss of mutual support by adjacent units.

ELEMENTS OF COMBAT POWER

EACH basic combat element must be provided sufficient combat power to enable it to move through comparatively light opposition almost at will. This will enable the larger force of which it is a part to attain and maintain a most important advantage on any battlefield—the *INITIATIVE*.

The ability to move at will requires that each unit be equipped with powerful weapons and possess superior combat power. The organic and supporting means must enable each unit to withstand prolonged attacks while dispersed; and then move with relative ease through local opposition when called upon to concentrate with its neighbors in order to perform some blocking, counterattack, or exploitation mission.



"The full development of the Pentomic concept is incompatible with foot speeds. Therefore we must have vehicles, both ground and air . . . . We must develop ground and air vehicles of types which can be moved economically by air. There are no insuperable obstacles in this direction and this gap should be closed in due course."

There seems to be a good chance that the same nuclear weapon which created this problem may also be able to solve it. In the past the nuclear weapon has been what must be termed a general support weapon rather than a close-in fighting weapon. At this point let me coin a term or two. Until now, the nuclear weapon has been an "outside" weapon; however, it is now clear that it soon will become an "inside" weapon, as well.

Inside firepower could be described as the kind which small combat units use as they go about their business. This is fighting firepower. It is largely a centrifugal force generated within the fighting unit which it can hurl outward around its periphery. Inside firepower is close, immediate, and

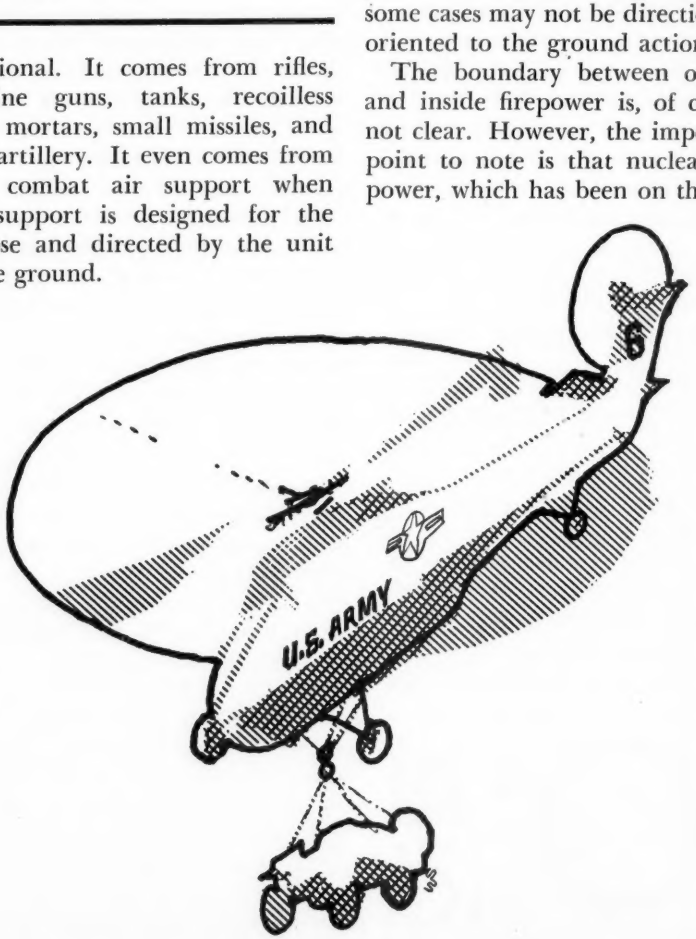
". . . The Army has been looking ever more fondly at the possibilities inherent in aerial vehicles and at the idea of surmounting ground resistance by the simple expedient of flying away, around, or over it. Even if there were no nuclear weapon, the low-flying aerial vehicle would figure heavily in the future of the land Army. Speed and freedom from terrain are factors with universal military value."

directional. It comes from rifles, machine guns, tanks, recoilless rifles, mortars, small missiles, and light artillery. It even comes from close combat air support when that support is designed for the purpose and directed by the unit on the ground.

All of this inside firepower has one common characteristic. It can be brought to bear on the problem which confronts the basic fighting mechanism, whether it be a squad, a tank, or some other small ground fighting force. Inside firepower can kill the enemy, stop his attack, or overwhelm his defense.

Outside firepower, on the other hand, is indirect, probably more powerful, usually slower in coming, and its effects are more remote from the problem of the basic fighting unit. This kind of firepower is not centrifugal and in some cases may not be directionally oriented to the ground action.

The boundary between outside and inside firepower is, of course, not clear. However, the important point to note is that nuclear firepower, which has been on the out-



side, is now crossing the boundary. In the not-too-distant future we may expect to see our smaller units equipped with their own accurate, mobile, low-yield nuclear weapons.

I am confident that this part of the gap between advanced concepts and current capabilities will be bridged successfully and that small combat units will be provided with firepower of such force that they will not only be able to survive in a widely dispersed posture, but will be able to move decisively and accomplish their missions.

A MAJOR problem exists in providing adequate conventional firepower in situations in which the use of atomic weapons is not authorized or has not been initiated. Our Pentomic organizations are designed for either atomic or non-atomic warfare. This dual (atomic / nonatomic) capability, coupled with the principle of pooling, results in a clear recognition that the organic artillery means of the Pentomic divisions must be augmented by appropriate reinforcing fires, particularly in nonatomic warfare.

In such an environment, the dispersal pattern must reflect a measured balance between dispersion on one hand and concentration for improved combat power on the other. Nonavailability of atomic firepower is thus offset by increased concentration plus increased nondivisional reinforcing fire support.

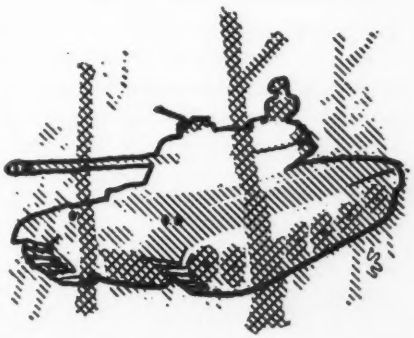
While it is recognized that this combination might, in some situations, be inadequate to accomplish the mission effectively, it is a calculated risk which, under current manpower and budgetary ceilings, must be taken. The alternative is to be prepared to employ tactical atomic weapons in a discriminating and selective manner designed to prevent the limited action from spreading to general war.

"Mobility has always been a military asset, but never more than today when it has been called to the center of the stage, not only on its own merits, but also as an antidote to dispersion."

LOGISTICAL PROBLEMS

THERE is a last requirement for battlefield mobility which involves the necessity for a logistical system which can survive under nuclear attack and which can function in any operational environment. Other advances cannot be completely meaningful in the absence of a solution to this problem.

Mobile operations as we now know them require heavily mechanized forces and forces moved by air. These, in turn, demand a rich diet of fuel, spare parts and maintenance. These supporting functions are massive, clumsy, and readily susceptible to detection and vulnerable to destruction. This



problem sometimes fails to attract the attention it deserves because it is so large, hydra-headed, and colorless.

Some progress is being made; however, in comparison with the distance yet to be covered, that progress is slow. Nonetheless there are bright spots on the horizon which must not be ignored. Nuclear power, in the distant future, may solve a large part of the fuel problem; and even before then we may see other new fuels which will give us such range that mobile task forces will be able to operate for days without replenishment. Nuclear weapons, when used, may very well reduce appreciably the ammunition supply problem. Irradiated foods may provide most of the rations.

In the meantime, however, we must eliminate or harden what is now the softest link in an otherwise fairly sturdy chain—the problem of logistic vulnerability. Not all of this problem lends itself to solution within Army jurisdiction. There is, for example, great potential value, for support of Army forces, in nuclear transport submarines and nuclear aircraft, including those which could be based on water.

Notwithstanding the fact that the world seems to be obsessed with the novelty of missiles and outer-space, a major advantage will accrue to that nation which gains a decisive lead in reducing its logistical vulnerability and in developing new logistical support capabilities.

FUTURE TRENDS

IN looking to the future, and in projecting the Pentomic concept beyond its present successful start, we must continue to seek the best balance between selective firepower (atomic and conventional) and new mobility means. The trends in development of future firepower are reasonably evident. In the field of battlefield mobility, we must look largely to new forms of air vehicles for our greatest advances.

Over the past few years the Army has been looking ever more fondly at the possibilities inherent in aerial vehicles and at the idea of surmounting ground resistance by the simple expedient of flying away, around, or over it. Even if there were no nuclear weapon, the low-flying aerial vehicle would figure heavily in the future of the land Army. Speed and freedom from terrain are factors with universal military value.

Obviously, there are extensive areas of the world's surface where ground vehicles cannot operate. Many of these areas are precisely where limited wars may take place. A speed capability of 35 to 50 miles an hour over any kind of terrain would be a revolutionary capability for a combat force. In nuclear

warfare, where reaction time is at a high premium, the 50 MPH force would probably be decisive if it could also perform useful military tasks enroute and at its destination. It is just here that a marriage of Army flying vehicles and very small fighting atomic weapons would be most meaningful.

The flying machines which the Army wants are only now in the early stages of development. There seems to be no doubt that the machines themselves can and will be built; however, the concept of a completely air mobile Army will remain a goal rather than a reality, until aerial vehicles can be simplified and their fuel and maintenance requirements reduced to manageable proportions.

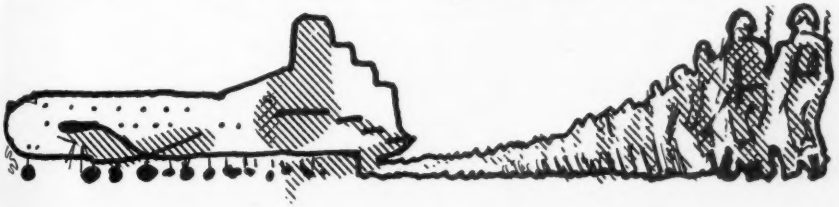
Pending attainment of that goal, the Army must exploit the new air vehicles on a progressive basis as they become available. These vehicles must be integrated into both tactical and support units to perform a wide variety of tasks. In addition, specialized units must be developed which are completely air mobile in organic aircraft and which take full advantage of the Army's rapidly growing aerial mobility in the accomplishment of varied combat tasks.

THE inference might be drawn from this discussion that the U. S. Army is unprepared to fight a modern war should it occur before all plans have come to full fruition or before all of the new equipment items are at hand. This is not the case. The Army is, and must be, ready to fight today, tomorrow, or any day.

Obviously, if we fight today we must do so with the weapons and capabilities on hand. The tactics we follow today must be consistent with the weapons of today; however, our tactics and training must be oriented toward the concepts and weapons of the future. The tactics of tomorrow are the blueprints for the weapons we need to execute those tactics. This forging ahead with our ideas is normal, healthy, and the genius of man. We have great capabilities now and we will have vastly greater capabilities ten years from now.

Modernization and adaptation is a continuing process. This process cannot go forward intelligently unless it pursues distant goals fully understood. The important thing is that we know where we are going and that our relative progress *vis-a-vis* our most likely opponents is satisfactory. Here we must avoid both complacency and alarm and stay hard at work.

The Army is moving forward fast. We are moving into unknown areas and untested concepts. Only an Army which is alive, alert, thinking, and planning can meet the challenge. That we have such an Army today should be a source of great pride to all of us.



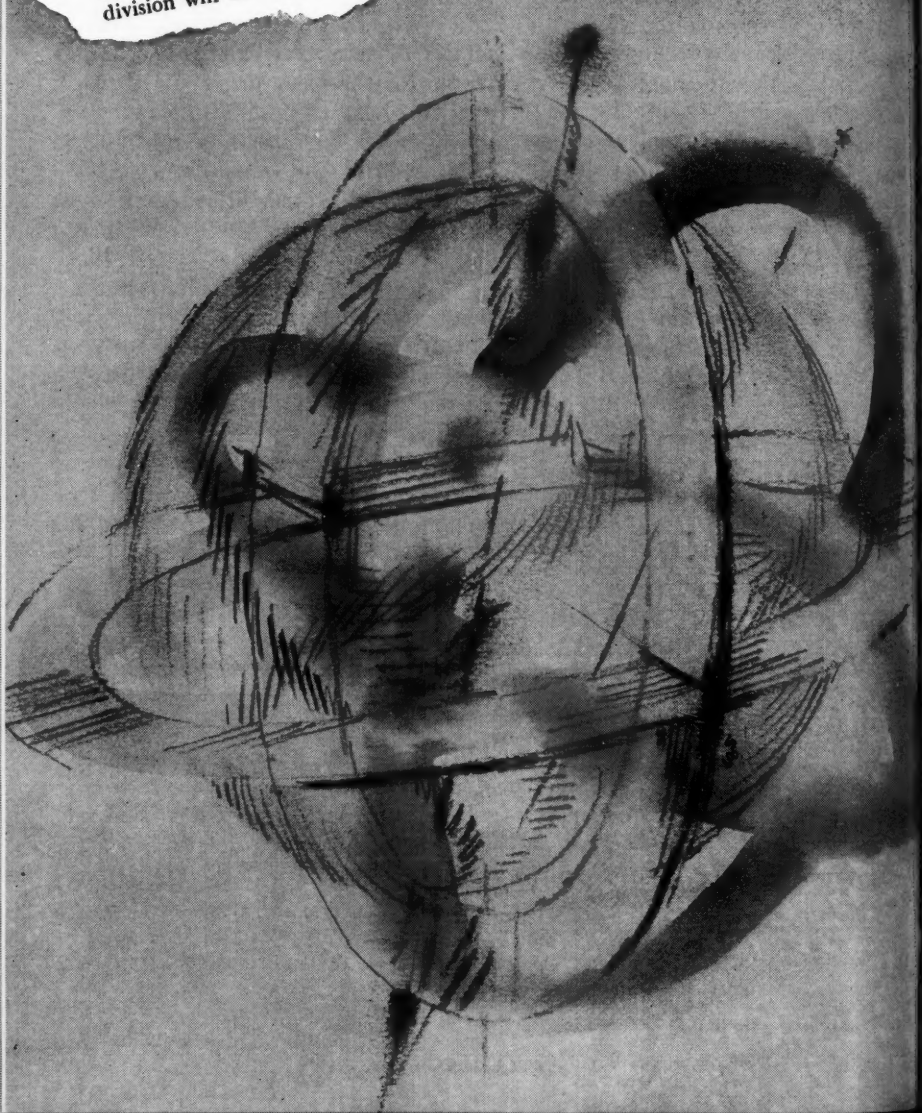
Gyroscope Revised

Beginning in December, Operation Gyroscope will be applicable only to units smaller than division-size, such as battle groups and battalion-size outfits. In operation since July 1955, the divisional rotation plan ended with exchange of the 3d and 10th Infantry Divisions in May. Although successful, the plan is being changed because of the inherent flexibility of the modernized pentomic organization that makes it more advantageous to rotate the smaller units. The new system is expected to permit a higher degree of readiness for divisions deployed overseas, since a small portion of any division will be rotating at any one time.

With one cycle now compl

divisional to battle group

TURN



eration Gyroscope moves from

ile maintaining its tested pattern of

and RETURN

Major John P. Morgan

THE ABOVE item from a recent issue of ARMY INFORMATION DIGEST marked the coming of age of Gyroscope—the Army system of unit rotation which was first set in motion in 1955, and which has since exerted ever-widening impact on Army units and their members.

As originally conceived, Operation Gyroscope was designed to increase the combat effectiveness of participating active Army units through improved morale, increased Regular Army enlistments and reenlistments, and retention of Regular Army personnel for sustained periods in the unit of their choice.

Recently, to exploit the increased flexibility of combat and combat-support units resulting from the Pentomic reorganization of major combat elements of the Army, Gyroscope was modified to provide for the rotation of infantry and airborne battle groups and selected smaller-size combat and combat-support units (rather than division-size units as heretofore) between continental United States and Europe. These changes involve adjustments in method of execution rather than changes in concept.

The rotation in May 1958 of the last elements of the 10th Infantry Division from Europe to Fort Benning, Georgia, and the last elements of the 3d Infantry Division from Fort Benning to Europe completed the initial phase of Gyroscope—*i.e.*, the rotation of division-size units. In the future, Infantry and Airborne Battle Groups will be the basic rotation elements in the Gyroscope plan.

WHY ROTATION?

FOR a number of years prior to the inception of the Army's Unit Rotation Plan, the maintaining of combat and combat support units at maximum operational readiness constituted a major Army problem. Although the system of individual replacements satisfactorily main-

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MAJOR JOHN P. MORGAN, Adjutant General's Corps, is on the staff of Distribution Division, Office of the Deputy Chief of Staff for Personnel, Department of the Army.

With his replacement on hand, a sergeant in Germany starts his trip to the United States.

tained the major combat elements of the Army at prescribed strength, the turnover of personnel in these units was so high as to adversely affect combat readiness and the unit's fighting potential. And as far as the individual replacement was concerned, a sense of belonging to a team, pride in unit and a feeling of security were notably lacking.

These deficiencies in the system of individual replacement were highlighted during the Korean War when combat units had to maintain under stress a seasoned fighting team composed of individuals accustomed to working with each other. The continued need for "breaking in" new replacements was expensive in time, personnel, and combat effectiveness.

As a means of overcoming these deficiencies, the Department of the Army considered both a unit replacement system and a unit rotation system. The former plan envisaged the relief in place of a

GYROSCOPE

	ORIGINAL PLAN—1955	REVISED PLAN—1958
Units	Divisions (Infantry, Armor and Airborne)	Battle Groups (Infantry and Airborne Divisions.) Composite FA Bn Direct Spt FA Bn Tank Bn Engineer Bn Recon Squadron } Infantry Divisions *Note:* Armored Divisions eliminated.
	Separate Regiments	Separate Regiments
	Non-Divisional Battalions and Smaller Size Units.	Non-Divisional Battalions and Smaller Size Units.
Oversea Tour	33 Months	33 Months
ZI Tour	31 Months	31 Months
Method of Rotation	Units paired with similar type units. Rotation between fixed stations.	Battle Groups and Divisional Battalions on a continuous rotation pattern. (Pairing of units discontinued.) Non-Divisional unit rotation remains unchanged.

Families and dependents of Gyroscope personnel travel concurrently by boat and train to new stations.

deployed unit with the assumption of the same designation by the relieving unit. The unit rotation plan, on the other hand, provided for the exchange of missions by the two units involved without changes in unit identity.

After careful study, the unit rotation plan was selected as being more practical and desirable. Designated by the code name Gyroscope, its implementation was ordered in 1955. Although Gyroscope was designed essentially as a unit rotation plan for divisional-size units, during its development stages selected non-divisional combat and combat support units of regimental size and below were included.

MODIFIED PLAN

AS HAS been pointed out, the new battle group rotation plan is not a revision in basic concept. Rather, it is primarily an adjustment in scope and a revision in method of execution.

Salient features of the modified Gyroscope plan include:

- Rotation of units between the United States and Europe initially.
- Rotation of Battle Groups, Field Artillery, Engineer and Tank Battalions and Reconnaissance Squadrons which are elements of Infantry Divisions. The control elements will remain in place to provide planning and operational continuity.
- Exclusion of Armored Divisions in their entirety from the unit rotation plan.
- Continued rotation of many of the non-divisional units.
- Rotation of Infantry and Airborne Battle Groups on a continuous rotation cycle. The units will not be specifically paired on a continuing basis with each other.

PERSONNEL ASPECTS

THE impact of this revised unit rotation plan can best be illustrated by tracing the hypothetical organization and rotation of a Gyroscope Infantry Battle Group from the continental United States to U. S. Army, Europe.

Approximately ten months prior to the scheduled rotation date of the unit, the Commander is directed by the Department of the Army to reorganize his unit for deployment to the oversea area. At this time, Regular Army volunteers possessing the requisite skills and experience are recruited to form

"It is anticipated that under conditions of modern warfare, the U. S. Army Replacement System will be composed of both individual and unit replacements. The latter may constitute as much as 25 percent of the replacements furnished to a major theater of operations."

the "hard-core" cadre of the unit. Heretofore these individuals enlisted for duty with the major element of an organization—*i.e., "Nth* Division." Under the newly revised plan, they will enlist for the specific Battle Group with which they wish to serve. This assures the Regular Army volunteer of service with the specific unit of his choice rather than with any element of a larger force.

SOME four months later—six months prior to the scheduled rotation date of the unit—the remaining personnel required to bring the unit to authorized strength are furnished by Department of the Army action. These members are mainly non-prior service enlistees and Selective Service personnel. Regular Army volunteers in this group supplement the "hard-core" of the unit and provide the required stability.

Following approximately six months of individual and unit training, the unit is prepared to move to its oversea destination. Individuals who are eligible for family quarters at the new station are authorized concurrent or simultaneous travel of their dependents.

What they think of Gyroscope

SURVEY OF ENLISTED VIEWS ON UNIT ROTATION

As part of the studies preceding the recent revision of Gyroscope from a divisional type of rotation to rotation by battle groups and battalion-size units, the Deputy Chief of Staff for Personnel was asked to survey attitudes of career soldiers with Gyroscope commitments. Opinion studies were carried out by The Adjutant General. The findings:

Career soldiers with Gyroscope commitments were definitely in favor of the plan to rotate small units rather than the existing divisional rotation policy.

Personnel surveyed were evenly divided on the question of "home station" to which the unit would return upon conclusion of each oversea tour.

Three out of four of the men sampled felt that it is sound policy to have headquarters and certain support elements remain in place while units rotate.

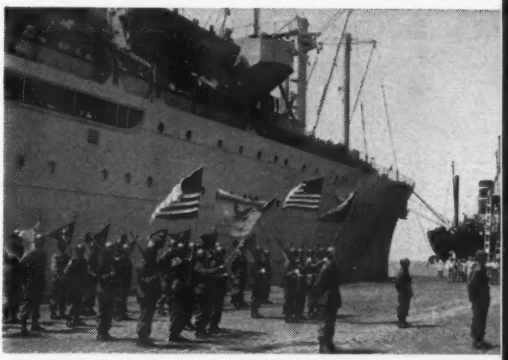
The Combat Arms Regimental System—in which the Army's combat arms units are members of distinguished regiments in which an enlisted man could remain throughout his service career—was approved by seven out of every ten men surveyed.

To a great extent, the opinions of enlisted men sampled are a direct reflection of experience in their respective units as a part of the Gyroscope program.

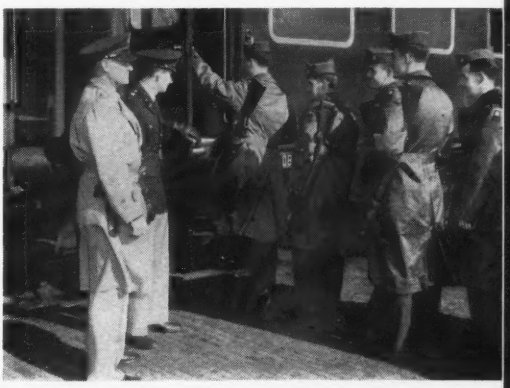
From "What the 1957 Soldier Thinks—A Digest of Attitude and Opinion Studies." page 3

On the first leg of their journey to replace a unit in Germany, soldiers board busses at a Stateside camp . . .

They are greeted by a band on arriving in Bremerhaven where . . .



below, an advance party precedes the unit to new station.



Arriving in Kaiserslautern, the soldiers detrain. Waiting busses take them to final destination.

FAMILY HOUSING— A MORALE FACTOR

WITH or without Gyroscope, one of the primary causes of lowered morale among enlisted personnel is the extended separation of a soldier from his family. Recognizing this fact, the Gyroscope plan provides for concurrent or simultaneous travel for dependents of the maximum number of eligible enlisted personnel in order to improve career attractiveness for these key members.

In creating these favorable conditions, however, due regard for the apportionment of available overseas family housing between Gyroscope and non-Gyroscope units had to be considered. This problem has been partially solved by limiting the number of approved volunteer applications for the Gyroscope unit to the number of family quarters made available to the unit on arrival in the oversea command.

STABILITY OF ASSIGNMENT

THE continued operational readiness of a unit depends, in great part, on the stability of personnel assignments achieved by the unit. Gyroscope was designed to provide this stability, particularly within the "hard-core" content.

Career personnel are offered the opportunity of remaining with the unit of their choice during both the CONUS and oversea tours; to this extent, it is considered that these soldiers have contracted an obligation with the Army which is mutually binding.

In the event the unit to which Gyroscope personnel are assigned is removed from the Unit Rotation Plan, options are offered these personnel in order to fulfill the Army's obligation. One option provides for the soldier's reassignment to a Gyroscope unit which is to be continued in the program, provided such unit is located within the same major command.

A second option offered, particularly in the case of oversea units, is the retention of the soldier in his present assigned unit until the end of his current oversea tour, with subsequent assignment to a Gyroscope unit in the United States.

A third option is to remain in his present assigned unit and withdraw from further participation in Gyroscope during the current term of enlistment.

All of these options are contingent upon the existence within the unit of choice of a vacancy in the skills which the Gyroscope volunteer possesses. Every effort, it must be emphasized, is and will continue to be made to permit the volunteer to continue in the Gyroscope program.

FUTURE ROLE

GYROSCOPE is designed to provide for the rotation of units during peacetime and under conditions short of general war. When the situation so dictates, the present unit rotation plan would be modified or perhaps suspended. In any event, the framework now exists upon which a wartime unit replacement plan can be built.

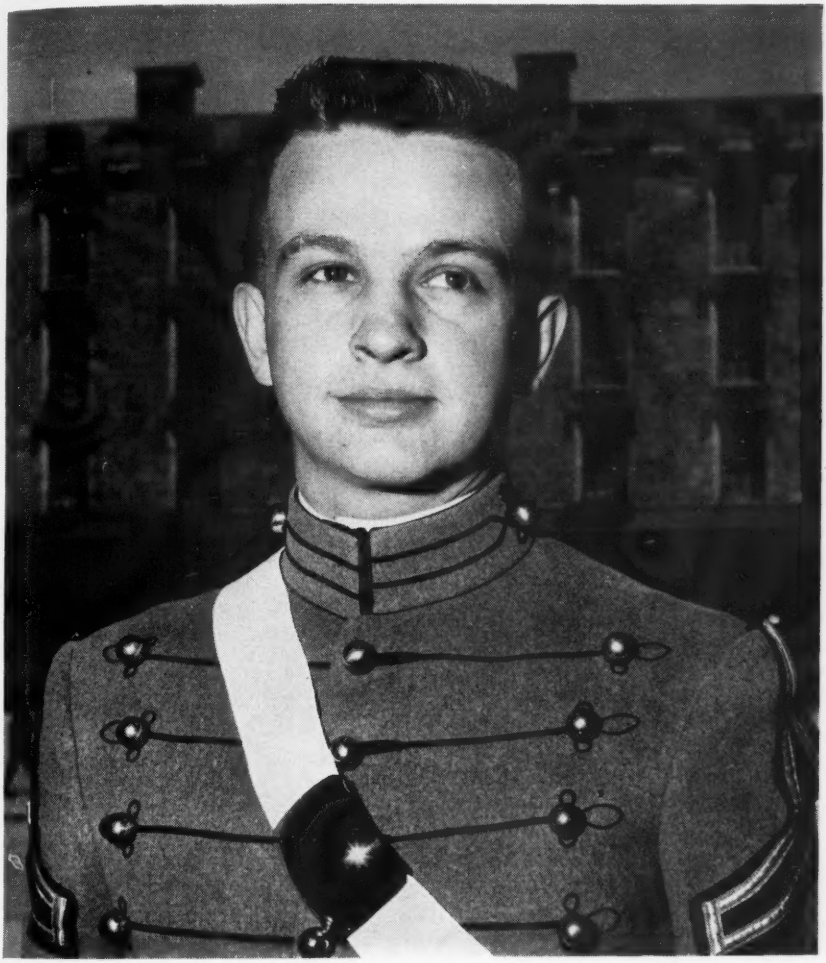
It is anticipated that under conditions of modern warfare, the U.S. Army Replacement System will be composed of both individual and unit replacements. The latter may constitute as much as 25 percent of the replacements furnished to a major theater.

Experience gained during operation of the unit rotation plan has already provided valuable planning guidance for the organization and movement of units between the United States and oversea areas.

In summary, Operation Gyroscope has provided a means, within budgetary and strength limitations, of rotating combat and combat support units between continental United States and oversea areas. It has improved career attractiveness for the Regular Army soldier by providing greater stability of assignment in the unit of his choice. As it moves onward to its next phase, it is evident that Gyroscope has achieved the principal objectives established at the time it was initially implemented.

THE INDEX to Volume 12 of Army Information Digest has been printed and distributed. Organizations, libraries or individuals desiring to maintain their files may obtain a copy by direct request to the Editor, Army Information Digest, Cameron Station, Alexandria, Virginia.

Pictorial Section:



Portrait of a

WEST POINTER

TO THE man on the street, and to many men in uniform, mention of the U. S. Military Academy almost invariably brings to mind rank upon rank of impeccably uniformed young men who are noted for their ability to parade in perfect cadence and alignment.

This mental picture is, of course, true in every respect. But there are also many other facets of life at the Military Academy which, combined, serve to portray the picture of a cadet in its entirety.

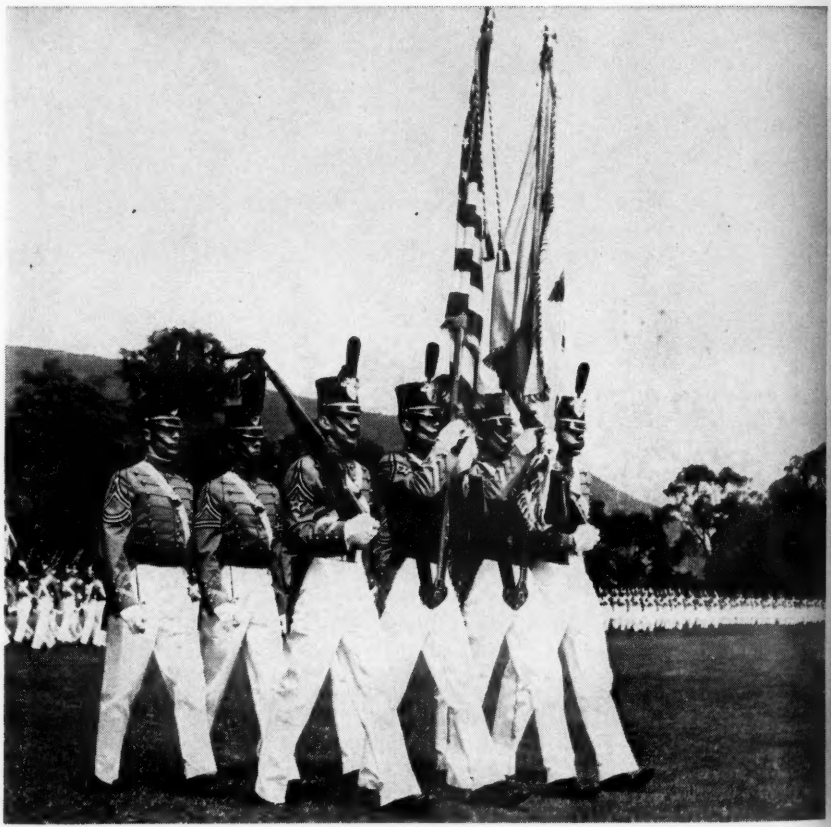
SINCE its establishment in 1802, the U. S. Military Academy at West Point, New York, has grown with the Nation, gearing its courses and systems to the requirements of the military services. Today's visitor to the Academy finds, side by side, the rich traditions and heritage of the past existing in harmony with an acute awareness of the needs and problems of the present.

Cadets come from all forty-eight states and the territories—a cross-section of American youth, selected on the basis of ability and promise. Here these young men work hard at their studies and athletics, make the most of a little leisure, and look forward to years of service and the chance to prove themselves worthy of their profession.

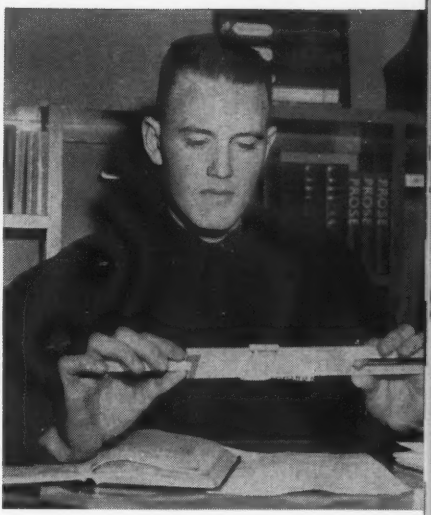
Every department of the Military Academy and every phase of the cadet's training make vital contributions to the development of his character and personality. The premise upon which West Point training is based is the fact that "Leaders are not born; they are developed."

Following are scenes of cadet life which, taken together, furnish a portrait-in-depth of today's West Pointer.

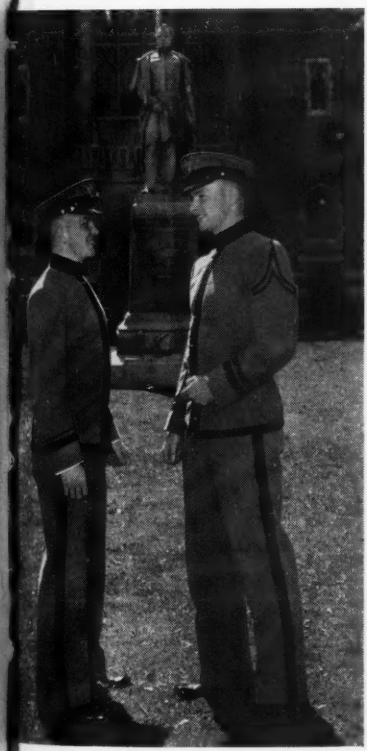
In perfect formation, the Corps of Cadets on parade is a never-to-be-forgotten sight, typifying part of the life at West Point.



On way to class, cadets check time on area clock. Cadet Chapel Tower looms over barracks in background.



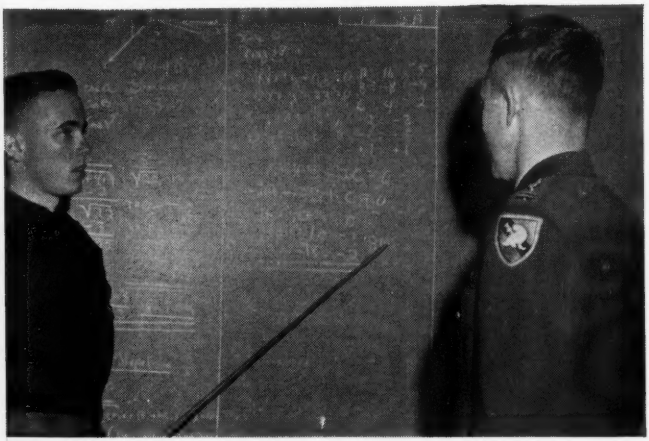
Preparing for next class, a cadet uses the ubiquitous slide rule during a mid-morning study period.



In precise formation, a platoon marches to Washington Hall, cadet dining room. At left, statue of Sylvanus Thayer, "Father of the Military Academy," looks down on two students during noon meal break.

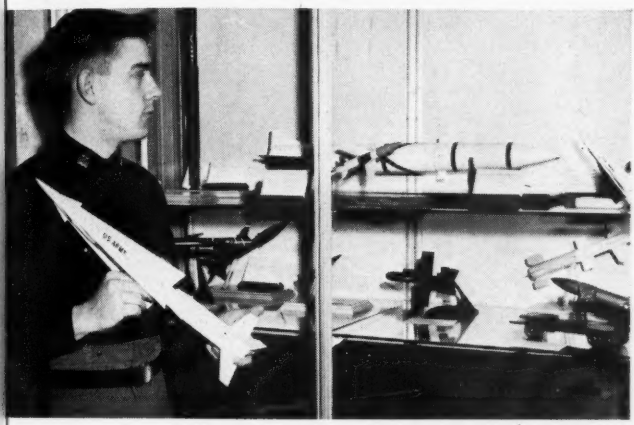
Standings in every subject are posted weekly for guidance and information of all members of the Corps.

Brass on a full-dress gray uniform gets a thorough check as a cadet scrutinizes contents of his wall locker.



Blackboard mathematics problem is analyzed, left, while a cadet, below, studies a Nike-Ajax missile.

The Army's Explorer satellite is the subject of a post-class chat with the Military Topography and Graphics instructor.



Models of various missiles are displayed in the Department of Ordnance.

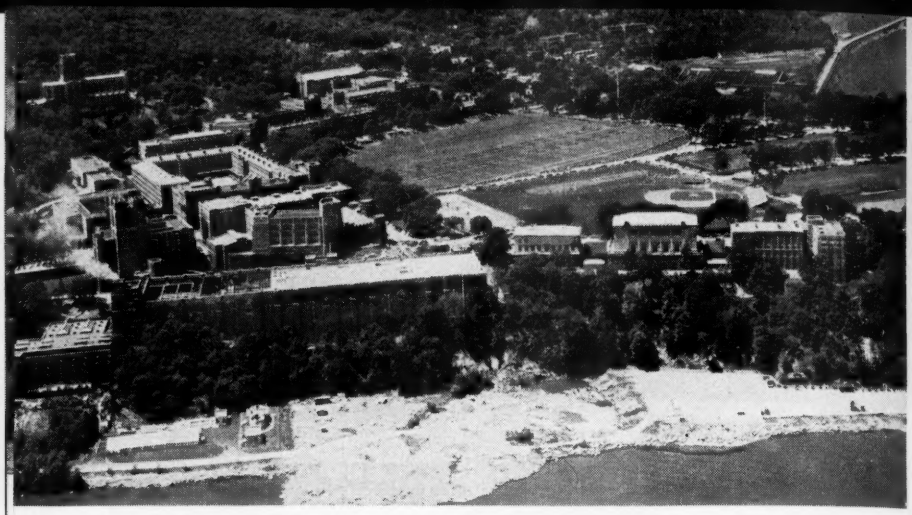
Details of an automatic transmission are explained by an instructor.

Summer training cycle takes cadets to the field at Camp Buckner . . .

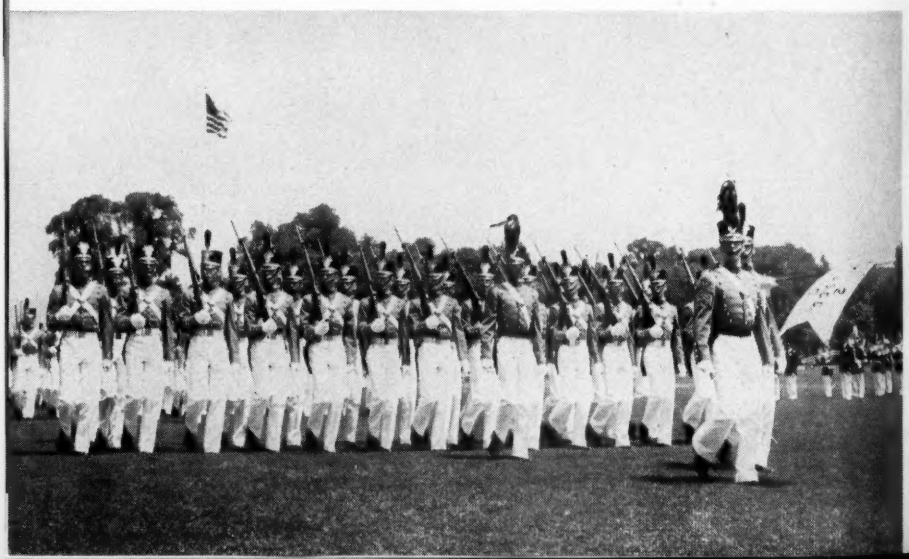
. . . where they study all types of weapons used by the Army.

Operating Radio station KDET is an extracurricular activity for cadet hobbyists.

It's not all work— West Pointers swim, engage in sports, take "drags" to hops at Cullum Hall.

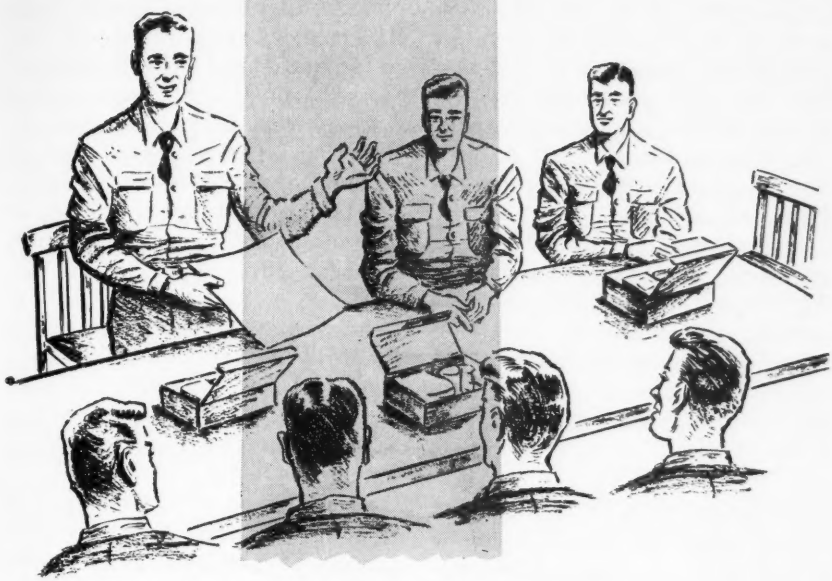


THROUGH the years that lie ahead, as the West Point graduate grows in experience, broadens his outlook, assumes ever-increasing responsibilities, the traditions and training of the United States Military Academy will serve him throughout his entire Army career. Gaining inspiration in retrospect, he may look back with pride to the long hours of study, the field training, the strenuous competition of athletics and the interludes of relaxation, the long gray line marching in precise parade formation, that marked the beginnings of his military career at West Point on the Hudson.



Distinguished speakers bring a dynamic message to interfaith groups in Second Army's

CHURCH WITHOUT WALLS



Chaplain (Colonel) Silas E. Decker

A GENERAL, a Congressman and a governor recently addressed an organization that has no dues, no membership roll, no expenses, no fixed meeting place; but does have a specific purpose. The name of the organization? The Men's Club of the Chapels of Fort George G. Meade, Maryland.

Here officers, enlisted men and civilians sit down at the same table once a month to hear distinguished speakers address an interfaith group that includes Protestants, Catholics and Jews.

CHAPLAIN (COLONEL) SILAS E. DECKER was Chaplain of Second United States Army prior to his present assignment as Post and Staff Chaplain, Fort Amador, Canal Zone.

Specific purpose of the Club is to promote the total religious program on post. It does this through the simple expedient of bringing together, under one roof, civilian and military personnel of all faiths and ranks in common brotherhood. Meeting in one of the enlisted service clubs at Fort Meade, the Club is in the universal sense a religious organization, or, as one soldier put it, "A church without walls."

Originally, the Club was composed of thirty or forty Protestant members of the 15th Street Chapel at Fort Meade who included a monthly luncheon meeting with a speaker on their program. After the first luncheon in the Spring of 1956, the monthly meeting grew in

popularity until members came up with the idea: "Why not extend the monthly luncheon program to include all of the religious groups on post?"

The idea was greeted with enthusiasm by other chaplains at Fort Meade, and October 1956 saw the first jointly-sponsored meeting of The Men's Club of the Chapels. The first session brought a turnout of over 200 enlisted men, officers and civilians.

Since then, the growth of the organization has been phenomenal. This year, between 300 and 400 persons at each monthly luncheon have heard a group of speakers that have included some of the foremost military and civilian figures in the Nation.

ORGANIZATION of the group is completely informal. Everyone who attends a luncheon meeting is considered to be a member, and if there is Club business to attend to —which is rare—everyone present has the opportunity to vote.

Officers include a president, a vice-president and a secretary. There is no need for a treasurer, since the Club has no money and no expenses. The monthly luncheon takes the form of a box lunch provided by the Post Exchange Officer at a modest price. This service eliminates the need for expensive dining arrangements.

Another important feature of the organization is that it does not take valuable time away from Club members. The entire program is contained within the lunch period, providing an extremely attractive and rewarding way to spend a noon hour.

An impressive speaker's list is one of the keys to the Club's popularity. Crowds of over 300 have heard men such as Governor Theodore R. McKeldin of Maryland, Senator Alan Bible of Nevada, Lieutenant General Lewis B. Hershey, Selective Service Director, and Major General Harry P. Storke, Army Chief of Information.

Lieutenant General George W. Read, Jr., Commanding General Second United States Army, serves as Honorary President of the organization and personally invites speakers to appear before the group.

A series of topics, as broad and inclusive as the Club's membership, is one of its principal features. Discussions cover many subjects in addition to those of a military nature.

Pleading the case of small business, Senator Alan Bible of Nevada stated that "unless measures are taken, we will witness a tragic irony of the century—the disappearance of small producers during a time of tremendous business activity."

Speaking on national preparedness General Lewis B. Hershey, Selective Service Director, told a Men's Club audience that "America will have to depend on forgetting non-essentials if it is to endure. History has not shown us many nations with their chests below their belts who have gotten them restored to their proper positions in front of the shoulders. I have the feeling that America will either restore its chest to where it belongs, or we'll have to argue that it was the greatest country on earth —while it lasted."

In another address before the group, Chaplain (Major General) Patrick J. Ryan, Army Chief of

Chaplains, said that "America can lead the free world only if it is strong in its moral and religious convictions. Democracy demands religion. If we wish to keep our rights, we must keep our God."

THIS broad, universal approach has made the organization an outstanding success in the field of education—as well as in the field of brotherhood.

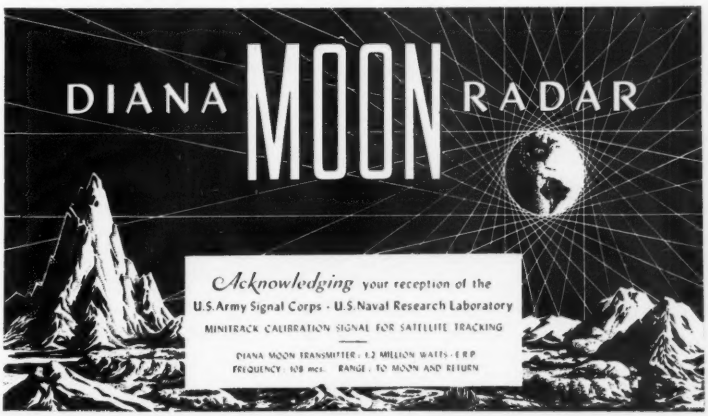
As Major General Storke, Army Chief of Information, recently told the group, there is a need for this type of organization throughout the Army. In addition to promoting religious activities, the Club serves another purpose. It is one of the few organizations that brings together military and civilian personnel who can jointly interpret the mission of the United States Army to the American public.

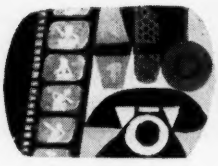
Thanks to the Club's initial success at Fort Meade, plans are under way to establish "Men's Clubs of the Chapels" at other installations in the Second Army area. A second organization of this type—at Fort Lee, Virginia—has already proved successful with attendance figures running into the hundreds.

The Chaplains at Headquarters, Second United States Army and Fort George G. Meade sponsor this unique organization because they recognize its value as a tool in the promotion of religion among men of all faiths. The Men's Club of the Chapels is, indeed, "A church without walls."

Calling All Moon Signals

QSL cards acknowledging reception of radio signals from outer space will be presented by the Army to amateur radio operators who successfully pick up signals during calibration tests of satellite-Minitrack stations. Signals at 108-megacycles are bounced off the moon before launching each United States satellite to determine whether Minitrack stations and amateur radio receivers are tuned to the transmitters carried by the satellite. Amateurs who receive such signals notify the Army Signal Research and Development Laboratory, Fort Monmouth, New Jersey, or the American Radio Relay League, West Hartford, Connecticut. In recognition, the Laboratory sends each reporting amateur an acknowledgement or QSL card—the first ever issued for picking up signals from the moon. (*See below.*)





COMMAND LINE

ON AIR DEFENSE AS A DETERRENT

"We in the Army are especially impressed with the deterrence which an effective air defense, to include an anti-missile system, provides. Both the Soviets and ourselves may in the future reach a stand-off position in thermonuclear attack capabilities. In short, we would both have the ability to destroy each other, and the balance of power between us would not be significantly altered by adding to an offensive capability that is already more than adequate to deliver mortal blows. In such a situation, the balance of power could be altered, however, if one side or the other develops a defensive capability significantly greater than its opponent, for by so doing, one reduces the thermonuclear attack capabilities of an enemy. By developing a really effective air and space defense, we would have the advantage in the diplomacy of deterrence."

The Honorable Wilber M. Brucker, Secretary of the Army,
at the Army Missile Orientation and Demonstration,
Fort Bliss, Texas, 30 June 1958

ON TACTICS AND LOGISTICS IN DISPERSED WARFARE

"One of the major influences of atomic weapons on the battlefield will be to make rather extensive dispersion essential, in order to reduce the size of the targets we provide and thereby to minimize the effect of enemy strikes. Dispersion, however, will increase the feasibility of infiltration. With large-scale infiltration by both adversaries, it is very likely that the combat zone will become an area many miles in depth. . . .

"In order to compel the enemy to concentrate so that he will provide a worthwhile target for our own atomic blows, and in order to be able to exploit those blows promptly after they are delivered, our dispersed tactical units must have sufficient mobility to assemble rapidly, strike, and disperse again before the enemy can react. They must also have a communications system capable of reliably directing these actions. And, since the tactical units will spend much of the time separated from each other, they must have a built-in capability to provide their own protection against an attacker who might otherwise defeat them in detail by picking off dispersed units one by one. . . .

"Supply installations must be dispersed and duplicated, for the same reasons that dispersion is essential for tactical units. The increases in the ranges of modern weapons and the deepening of the combat zone may well require that the logistical installations be located considerably farther to the rear. Supply lines, while possibly being longer, will certainly have to be more numerous. Greater dispersion of the combat units being supported will complicate the logistics problem extensively."

General Lyman L. Lemnitzer, Vice Chief of Staff,
before the Advanced Class, The Armor School,
Fort Knox, Kentucky, 10 June 1958.

ON FLEXIBILITY IN PLANNING

"It is difficult to predict future developments in the field of missiles which has seen so many dramatic advances in recent years. Scientific and technological breakthroughs undreamed of today may well inspire radical changes in future missile development. We in the Army realize we must remain flexible in our thinking and in our missile research and development program in order to take advantage of future discoveries."

The Honorable Wilber M. Brucker, Secretary of the Army,
at the Army Missile Orientation and Demonstration,
Fort Bliss, Texas, 30 June 1958

EXCERPTS FROM RECENT PUBLIC STATEMENTS REFLECTING TOP-LEVEL ARMY POLICY AND THINKING ON SIGNIFICANT MATTERS OF ARMY CONCERN

ON SPIRIT AS A DYNAMIC FORCE

"Nothing can take the place of an invincible spirit. General Marshall once said: 'It is not enough to fight. It is the spirit which we bring to the fight which decides the issue. It is morale that wins the victory. With it, all things are possible; without it everything else counts for naught.' One soldier of poor spirit who cries: 'All is lost!' can turn an attack into a rout. One stalwart who firmly shouts: 'Let's go!—Follow me!' can turn a rout into a great victory. It is the same in any field of endeavor."

The Honorable Wilber M. Brucker, Secretary of the Army, at Hope College, Holland, Michigan, 2 June 1958.

ON THE ARMY'S MOBILITY NEED

"The Strategic Army Corps . . . contains the top priority divisions and supporting troops which we would send first to a scene of emergency. We keep these divisions constantly ready to move either by air, sea, or a combination of both. It is the need to give mobility to this force which causes us to be so vocal in our insistence upon the requirements of strategic movement. The Army does not control the means necessary for such movement. We are hitchhikers of the Air Force and of the Navy. We look to our air and naval colleagues to maintain in readiness the means of transport which we would require, and stress the need for careful joint planning and training to assure our speed of reaction."

General Maxwell D. Taylor, Army Chief of Staff, before the National Military Industrial Conference, Chicago, Illinois, 19 February 1958.

ON FUTURE WARFARE

"It may well be that, for the Army to carry out its mission successfully under conditions prevailing in the future, changes will be necessary in both methods and equipment. While it would probably be wrong to predict that it will not be feasible to employ massed armor in the manner made familiar in Western Europe during World War II, it is possible that such concentrations will only be able to operate effectively in areas which are more extensive than was previously the case. Certainly, with less well defined distinctions between the combat zone and the rear area, reconnaissance and screening missions will become more vital than ever.

"Close integration between the use of tanks and missiles, with the armor moving rapidly to exploit the effects of the missiles by its own firepower and shock action, will be essential. Unquestionably, it will be desirable to enhance armor's firepower with atomic weapons. Increased mobility must also be sought, perhaps through the development of lighter tanks, perhaps through improved engines or better fuels. Another aspect of that subject, but an equally vital one, concerns the development of more easily handled fuels and more effective methods of delivering them."

General Lyman L. Lemnitzer, Vice Chief of Staff, before the Advanced Class, The Armor School, Fort Knox, Kentucky, 10 June 1958.

Savage thunder shook New Mexico's sun-scorched earth as the U. S. Army flexed flame-drenched muscles in the Nation's largest missile demonstration—

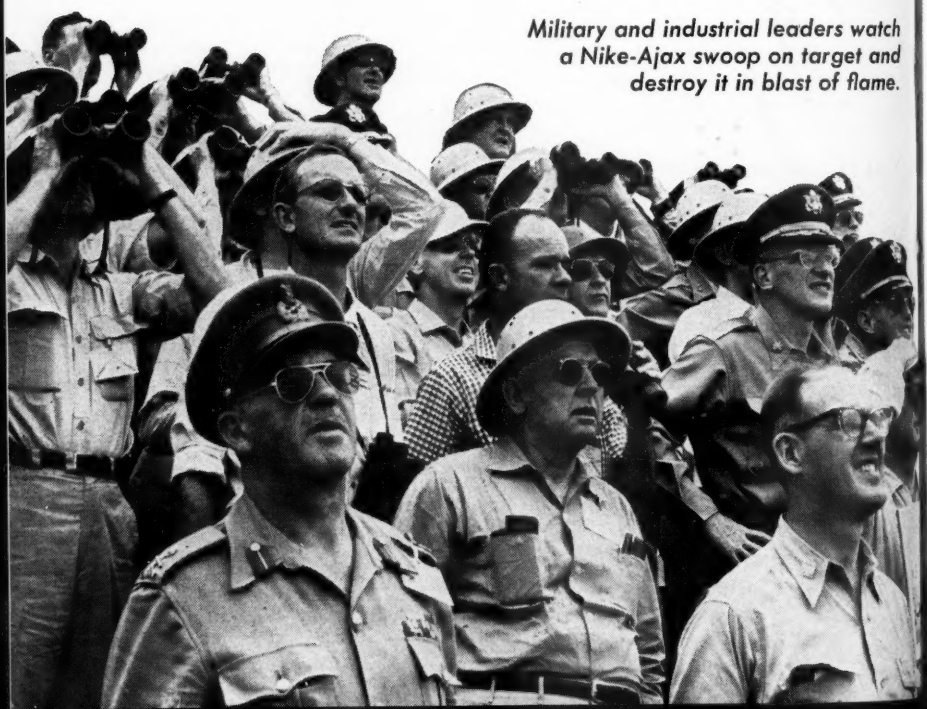
Project AM

Captain Charles G. Wellborn, Jr.

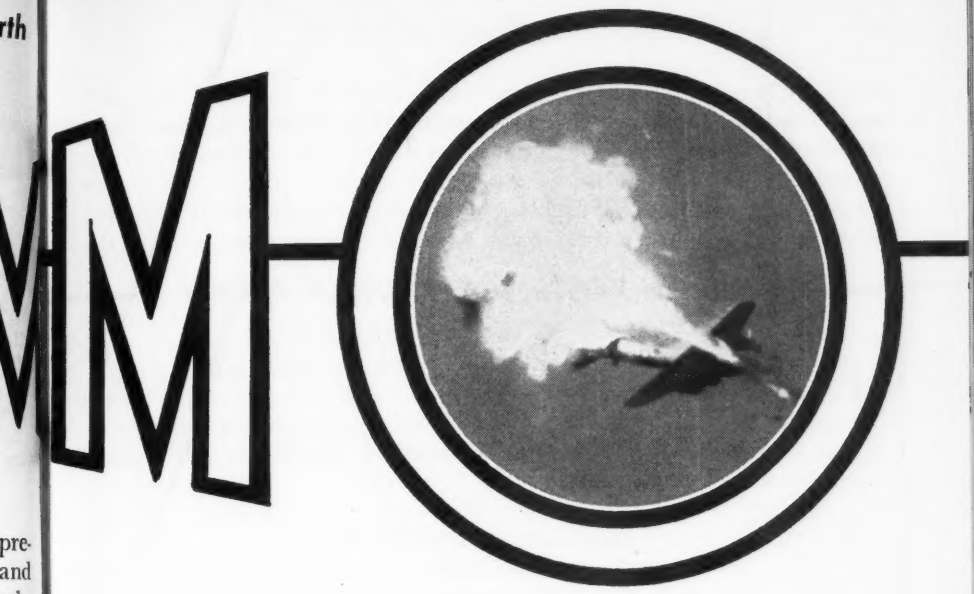
MORE than 400 distinguished government, military and industry leaders took a close look at the Nation's largest demonstration of missile striking power in a two-day program at the U. S. Army Air Defense Center, Fort Bliss, Texas, and White Sands Missile Range on 30 June and 1 July. Over a hundred newsmen representing publications, radio and television stations and networks coast to coast covered the event.

The foremost question on the visitors' minds: What does the U. S. Army have to offer the Nation in the missile field?

The answer: An operational



Military and industrial leaders watch a Nike-Ajax swoop on target and destroy it in blast of flame.



family of missiles with the accuracy and mobility required for modern-day deployment; and a program in full swing to improve the weapons on hand and develop new ones.

Guests were invited by Secretary of the Army Wilber M. Brucker and Army Chief of Staff Maxwell D. Taylor. Hosts at Fort Bliss were Major General Sam C. Russell, Commandant of the U. S. Army Air Defense School, largest and oldest guided missile training center in the United States, Major General W. E. Laidlaw, Commanding General, White Sands Missile Range, and top executives from fourteen contractor firms for the Army missile program. *(See box, INDUSTRY HOSTS, page 34.)*

The project was coordinated by the Army Chief of Information, Maj. Gen. Harry P. Storke, his deputy, Brig. Gen. C. V. Clifton, and Col. George R. Creel, project officer.

The Department of the Army delegation was headed by Secretary of the Army Wilber M. Brucker; the executive branch of the government by George V. Allen, Director, United States Information Agency; NATO by General B. R. P. F. Hasselman, chairman of the Military Affairs Committee in permanent session.

Military representation included Air Force General Nathan F. Twining, Chairman of the Joint Chiefs of Staff; General Maxwell D. Taylor, Army Chief of Staff; Lieutenant General Arthur G. Trudeau, Army Research and Development Chief; Lieutenant General Charles E. Hart, head of Army Air Defense Command; Major General J. H. Hinrichs, Army Chief of Ordnance; Major General John B. Medaris, Com-

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CAPTAIN CHARLES G. WELLBORN, JR., Infantry, Production Editor of ARMY INFORMATION DIGEST, *witnessed the Project AMMO demonstration of U. S. Army missile and rocket power at Fort Bliss, Texas, and White Sands Missile Range.*

manding General, Army Ordnance Missile Command, and many more top-ranking officers.

Generals and Admirals from twelve NATO nations saw demonstrated missiles already in the hands of U. S. troops overseas, and judged for themselves other missiles soon to be on the way.

THE first day's activities started with a demonstration of the

INDUSTRY HOSTS FOR PROJECT AMMO

FOURTEEN industries sent distinguished representatives as co-hosts for Project AMMO—the Army Mobile Missile Operation conducted at Fort Bliss, Texas, and White Sands Missile Range, 30 June-1 July. The industries, their products, and their top representatives present included:

CHRYSLER CORPORATION
Detroit, Michigan
Redstone and Jupiter Missile Systems
Thomas F. Morrow, Group Vice President, Defense and Special Products.

CURTISS-WRIGHT CORPORATION
Utica, Michigan
Dart Missile (Aerophysics Development Corp., Prime Contractor)
Ronald S. Gall, Director of Public Relations

DOUGLAS AIRCRAFT COMPANY
Santa Monica, California
Honest John Rocket, Nike-Ajax, Nike-Hercules
Donald W. Douglas, Jr., President

THE FIRESTONE TIRE AND RUBBER COMPANY
Los Angeles, California
Corporal Missile
John L. Cohill, Vice President in Charge of Non-Tire Subsidiaries

GILFILLAN BROS., INCORPORATED
Los Angeles, California
Ground and Air Guidance System for Corporal Missile
Joseph H. Miles, President

THE MARTIN COMPANY
Orlando, Florida
Lacrosse Missile, Missile Master, Pershing Missile
William B. Bergen, Executive Vice President, The Martin Company

NORTHROP AIRCRAFT INCORPORATED
Beverly Hills, California
Target Drones (RCAT and R–P 77D and R–P 76 Target Missiles)
R. R. Miller, Vice President and General Manager Northrop Division

"Chopper John" concept. An Honest John rocket, a lightweight launcher and a vehicle were brought to the launching site by H-37 Mojave helicopters. RCAT target drones put on a show of aerial acrobatics while the Honest John crew emplaced the missile for launching. The Honest John lifted in a graceful arc and hit its target —the exact center of a mountain peak miles away—with the preci-

RADIO CORPORATION OF AMERICA
Missile and Surface Radar Department
Moorestown, New Jersey
Talos Missile, Instrumentation Radar, Electronic Equipment
Meade Brunet, Staff Vice President RCA, New York

RAYTHEON MANUFACTURING COMPANY
Waltham, Massachusetts
Hawk Missile, Electronic Communications, Radar
Charles F. Adams, President

SIKORSKY AIRCRAFT DIVISION, UNITED AIRCRAFT CORPORATION
Stratford, Connecticut
H–37 Mojave, H–34 Choctaw and H–19 Chickasaw Helicopters
Lee S. Johnson, General Manager

SPERRY UTAH ENGINEERING LABORATORY DIVISION OF SPERRY RAND CORPORATION
Salt Lake City, Utah
Sergeant Missile, Radar, Computers, Fire Control Systems
Dr. C. A. Frische, President, Sperry Gyroscope Company Division of Sperry Rand Corporation

THIOKOL CHEMICAL CORPORATION
Trenton, New Jersey
Solid Propellants, Liquid Rocket Engines, Synthetic Rubber, Chemicals
J. W. Wiggins, Assistant General Manager Redstone Division

UNITED STATES STEEL CORPORATION
Pittsburgh, Pennsylvania
Special Steels for Missiles, Ground Handling and Launching Equipment, Motor Cases
Clifford F. Hood, President

WESTERN ELECTRIC COMPANY
New York, New York
Nike-Ajax, Nike-Hercules (Prime Contractor)
C. R. Smith, Vice President, Radio Division, Western Electric Company

Demonstrating the "Chopper John" concept, an Honest John's lightweight launcher is brought to site by an H-37 Mojave helicopter.

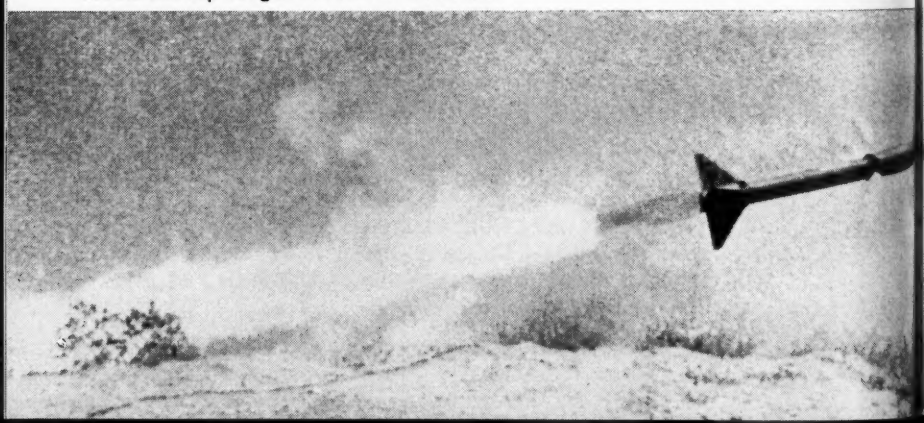
sion of conventional artillery.

The Nike-Ajax surface-to-air missile was next on the program. Two missiles were sent aloft on the track of a radio-controlled B-17. One, however, was all that was necessary. The missiles roared from their launching positions in front of the stands, arched toward the bomber drone, and as the voice from the missile tracking site announced "intercept," the airplane burst into flames and careened to earth.

After a briefing and demonstration of the Missile Master and Missile Monitor, the observers travelled to Orogrande Range, where a Corporal ground-to-ground missile was launched. After its flaming, slowly-rising start, the Corporal picked up speed rapidly and shot vertically into the desert sky, disappearing except for its contrail. That, too, disappeared for a while; then a new contrail appeared in the distance, pointing a finger at the Corporal's target. Again, a perfect hit.

After moving to Hueco Range, observers saw a demonstration of helicopters used as mobile gun platforms for suppressive fire. Armed with machine guns and rockets, the helicopters demonstrated a Cavalry-type tactical mission of reconnaissance in force. What distinguished this demonstration from a typical Cavalry operation was the fact that the mounts were not ground-bound. While the area was under suppressive fire by the armed reconnaissance helicopters, the action was completed with the arrival of Infantry troops, also by helicopter, to seize and occupy the area. (For more on the role of armed helicopters, see "Army Aviation = Battlefield Mobility," August 1958 DIGEST.)

And this is the result—Honest John missile blasts off with a roar, to seek its mountain-top target in the far distance.

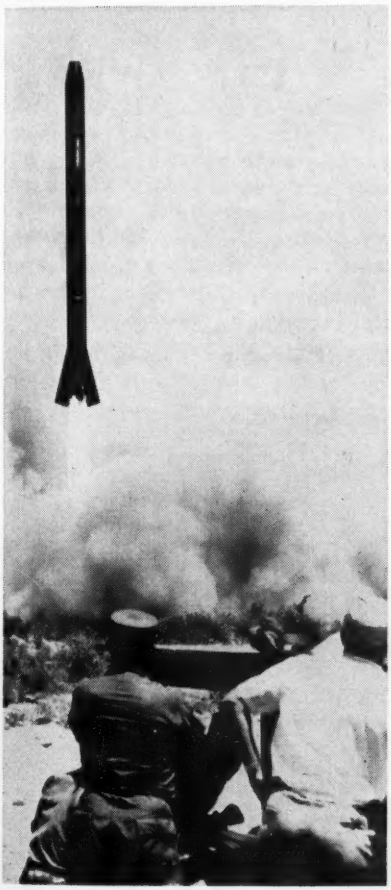


Leaping to flight, an OQ-19 radio-controlled drone serves as target for Army missile crews.

Secretary of the Army Wilber M. Brucker addressed the guests at a dinner in the Fort Bliss Officers' Mess. Guests of honor included industry representatives (*see box*) and prominent government and military personages.

THE next morning, all observers were driven to White Sands Proving Ground where Major General W. E. Laidlaw, Commanding General, White Sands Missile Range, explained the tri-service nature of operations at the range. Major General John B. Medaris outlined the organization of the U. S. Army Ordnance Missile Command, its mission, and its projects. He stressed the importance of the Army's ability to coordinate the efforts of industry, science and government for the national defense.

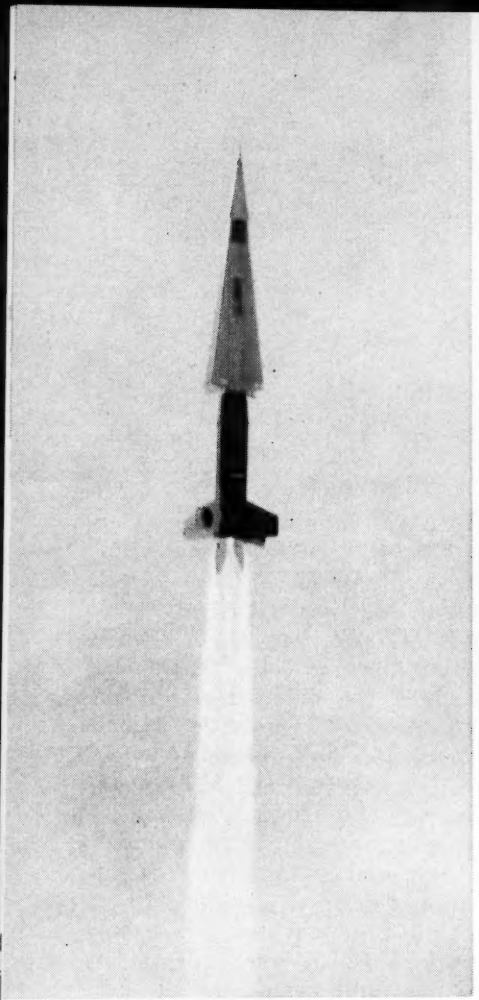
Burst of flame marks takeoff of Corporal guided missile, capable of carrying atomic or conventional warhead.

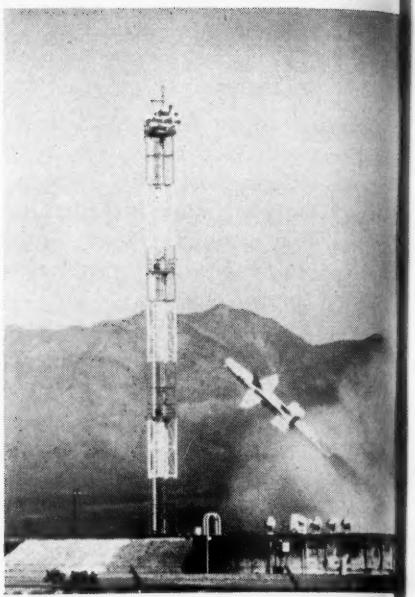


Unlike the previous day's demonstrations which were put on by tactical units stationed at Fort Bliss, the White Sands launchings were research and development trial shots fired for technical evaluation purposes.

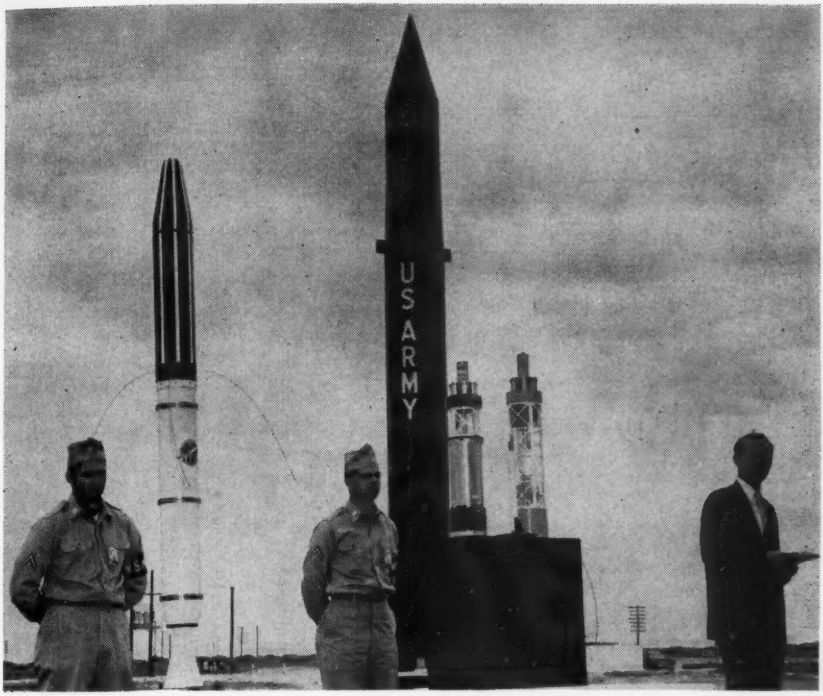
First demonstration was of the Talos Missile System, developed by the U. S. Navy and now operational for shipboard use. The system now is under evaluation by the Department of the Army for land-based use. The Talos, a surface-to-air missile, was launched with the aid of a booster which fell off, allowing a ramjet engine to take over propulsion.

Next, briefings on the Redstone and Sergeant missiles were conducted. The Redstone, already in





At three different angles, three missiles hold crowds enthralled—above, Navy-developed Talos uses a land based launcher adapted by the Army; left, Nike-Hercules takes off almost straight up while, below, the Hawk blasts off, seeking a low flying jet plane used as a target.



With a huge Redstone missile in background, Dr. William H. Pickering, head of Jet Propulsion Laboratory, describes fine points of Explorer satellite.

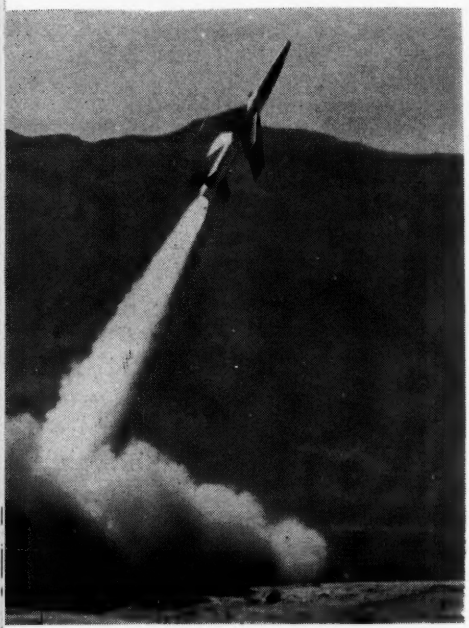
the hands of troops, has been successfully launched by soldier-crews at White Sands. The Sergeant (*see front cover*) is a solid propellant ground-to-ground missile designed to replace the Corporal. Described as "the first truly second generation surface-to-surface tactical missile," it is an extremely mobile weapon which can be emplaced quickly and fired by a small crew under almost any conditions.

The Nike-Hercules, already emplaced on guard at key United States cities and scheduled for many more areas in the future, was the next missile on the firing line. Demonstrated with a conventional explosive warhead, the missile is capable also of using an atomic warhead. The Nike-Hercules took off with a deafening roar and disappeared from sight. Tracking radars indicated that it had hit its simulated target, but at too long a range to be observed from the launching site.

The Director of the Jet Propulsion Laboratory of California Institute of Technology, Dr. W. H. Pickering, presented an orientation on a rocket program which is not a weapon program but which, nevertheless, utilized a military missile (Jupiter-C, a modified Redstone) to launch the Explorer satellite into orbit.

AFTER a close-up inspection of displays of various missile systems, the observers moved to another White Sands area to observe firing of four more missiles. The first of the afternoon, and possibly the most spectacular of the entire two-day period, was the Hawk—the

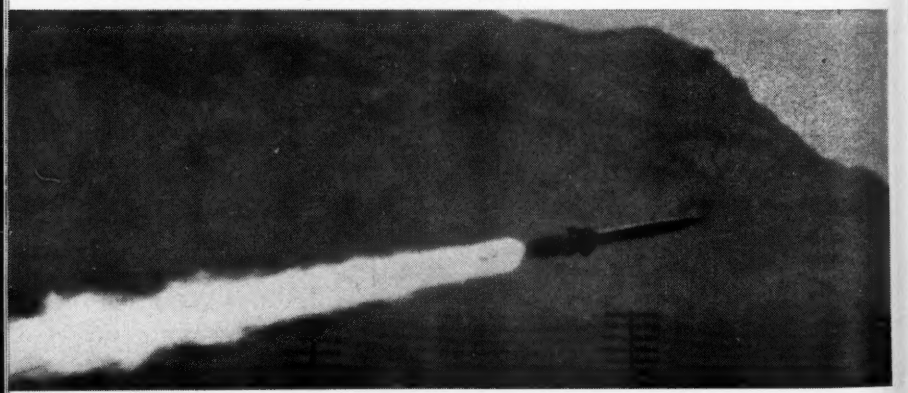
Flares on wingtips of Dart allow its flight to be followed as it seeks out and destroys a tank in the distance.



newly developed missile which detects and tracks low flying aircraft. Demonstrated for the first time to newsmen, photographers and radio-TV representatives, the Hawk showed great mobility and uncanny speed of employment.

As all eyes watched the Hawk on its launcher, an F-80 radio-controlled jet fighter target released smoke to enable the observers to detect it at the outermost range of vision. The count-down continued. At the command "fire" the Hawk shot from its launcher, then to a course straight at the F-80, and swooped upon its prey from above, destroying the airplane in a great burst of flame. A small piece of the jet's wing was brought to the launching area later—ripped, torn

A cloud of smoke and dust is whipped up by the Lacrosse missile as it heads for a ground target, above left, while below the Little John, scaled down version of Honest John, trails brilliant flame.



and full of gaping holes.

The Army's smallest guided missile, the ground-to-ground Dart, was launched at a tank in front of the spectator stands. It zigzagged a few times as if getting a better look at its target, then plunged into the tank, destroying it in an explosive holocaust. Observation of the Dart's course was facilitated by

Backdrop for the Missile Shoot

SITE AND SETTING for Project AMMO demonstrations were two key installations of the Army's missile program—the U.S. Army Air Defense Center at Fort Bliss, Texas, and the White Sands Missile Range in New Mexico.

THE U. S. ARMY AIR DEFENSE CENTER, commanded by Major General Sam C. Russell, encompasses key training and development activities of the Army's antiaircraft artillery and guided missile program, including the U.S. Army Air Defense School, the U.S. Army Training Center Antiaircraft Artillery, the 1st Guided Missile Brigade, 6th Antiaircraft Artillery Group, 61st Ordnance Group, the U.S. Army Air Defense Board, and the Office of Special Weapons Development.

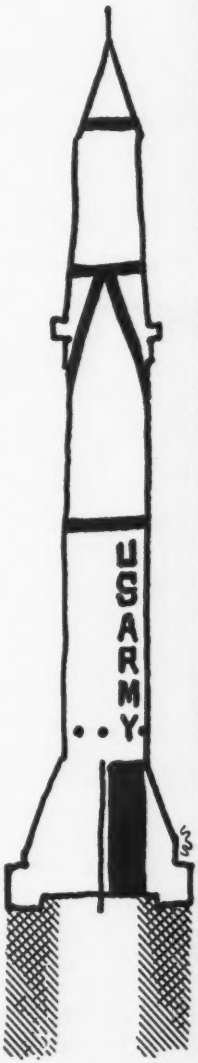
Primary mission of the Center is the training of individual antiaircraft artillerymen, guided missilemen, and units. Since its establishment in July 1946, the Center has trained more than 55,000 officers and men for missile units.

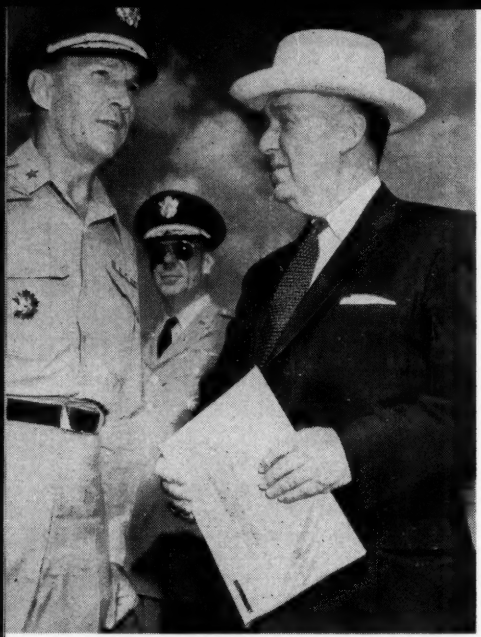
THE WHITE SANDS MISSILE RANGE, located nearby, is commanded by Major General W. E. Laidlaw. An element of the U.S. Army Ordnance Missile Command, it is the largest overland rocket and guided missile testing center on the North American continent. Stretching approximately 100 miles north and south, and about 40 miles wide, the Range lies between Albuquerque (225 miles to the north), Alamogordo and Las Cruces on east and west, and El Paso (50 miles to the south). The southern boundary of the range adjoins Fort Bliss.

An example of unification in action, the huge installation employs more than nine thousand, military and civilian, including Army, Navy, Air Force and Marine Corps members. Established in 1952 by a special directive of the Secretary of Defense as an Integrated Range for use of all three services, the range is operated by the Department of the Army, with responsibility delegated to the Army Chief of Ordnance. Included within its boundaries are the Army Missile Test Center, the Naval Ordnance Missile Test Facility, and the Air Force Missile Development Center.

About 400 missions per month are conducted on the range. It is utilized by contractors for research and development work, and by the three services for weapon systems evaluations and training firings. Here Army combat units conduct annual practice with Nike and Corporal missiles.

Army Ordnance Corps activities at White Sands Missile Range are coordinated with three other primary installations: the Army Ballistic Missile Agency, Army Rocket and Guided Missile Agency, and the Jet Propulsion Laboratory—all of which are under direct control of the Army Ordnance Missile Command at Huntsville, Alabama. (See "U.S. Army Ordnance Missile Command Established," July 1958 DIGEST.)

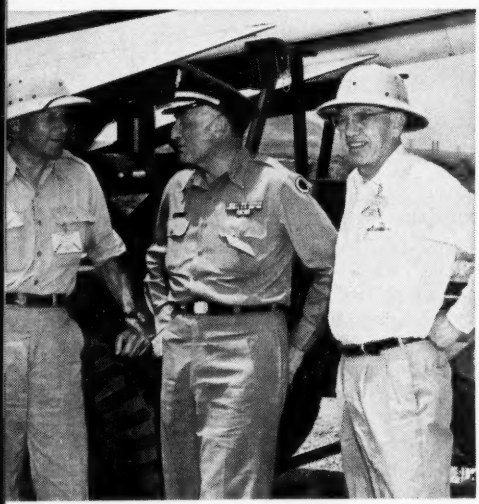




Brig. Gen. George W. Power, Commanding General, 1st Guided Missile Brigade, confers with Hon. Dewey Short, Assistant Secretary of the Army (Civil-Military Affairs).

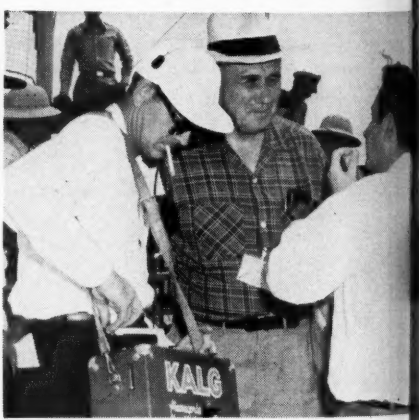
Dr. Paul D. Foote, Assistant Secretary of Defense (Research and Engineering) joins Gen. Nathan F. Twining, Chairman, Joint Chiefs of Staff, at lunch.

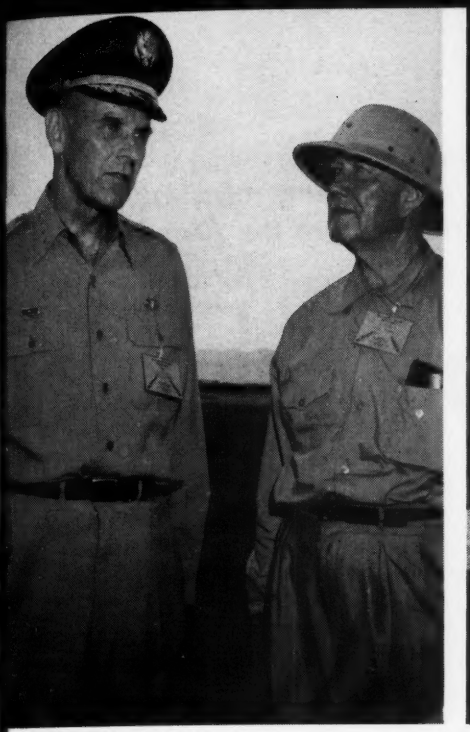
Vice Admiral Charles Wellborn, Jr., Commandant, Armed Forces Staff College, greets Hon. George H. Roderick, Assistant Secretary of the Army (Financial Management), and Dr. William H. Martin, Director of Army Research and Development.



Gen. Arthur G. Trudeau, Chief of Army Research and Development, talks to industry representatives.

At right, newsmen interview Hon. Hugh M. Milton II, Assistant Secretary of the Army (Manpower, Personnel and Reserve Forces).





Gen. Maxwell D. Taylor, Army Chief of Staff, talks with Clifford F. Hood, President, United States Steel Corporation while, at right, Secretary of the Army Wilber M. Brucker converses with Maj. Gen. Sam J. Russell, Commanding General, U. S. Army Air Defense Center and Maj. Gen. W. E. Laidlaw, Commanding General, White Sands Missile Range.

Army Chief of Information Maj. Gen. Harry P. Storke, right, discusses information aspects of Project AMMO.

flares burning on each side of its stubby wings.

The Little John Rocket showed the mobility qualities which make it such a valuable addition to the Army's arsenal. Although its impact area was out of sight of the observation point, the report that the rocket hit its target reached the viewers shortly after impact.

The Lacrosse surface-to-surface missile was the last to be demonstrated, and it, too, roared from its launcher in a perfect shot which landed right on target.

THE object of Project AMMO —the Army Mobile Missile Operation—was to show the Army's missile might. No observer could have left Fort Bliss and White Sands unimpressed.

Stepped-up power and range, improved speed and ease of handling missiles are among the benefits accruing from the Army's role in

Developing High Powe

Dr. Ralph C. Swann

THE UNITED STATES ARMY has played a leading role in the development of the high power rocket engines which make the advanced guided missile and rocket weapons of today possible. These advancements were largely based on the Army's early recognition of the essential requirements for development of satisfactory high performance solid propellants.

The groundwork for today's improved solid propellant rocket engines was laid by research begun in the '40s at the Jet Propulsion Laboratory of the California Institute of Technology. Effort was expanded considerably when the Thiokol Chemical Corporation began its rocket propellant program under Army sponsorship in 1949. That organization contributed materially in reduction of research data to engineering practice.

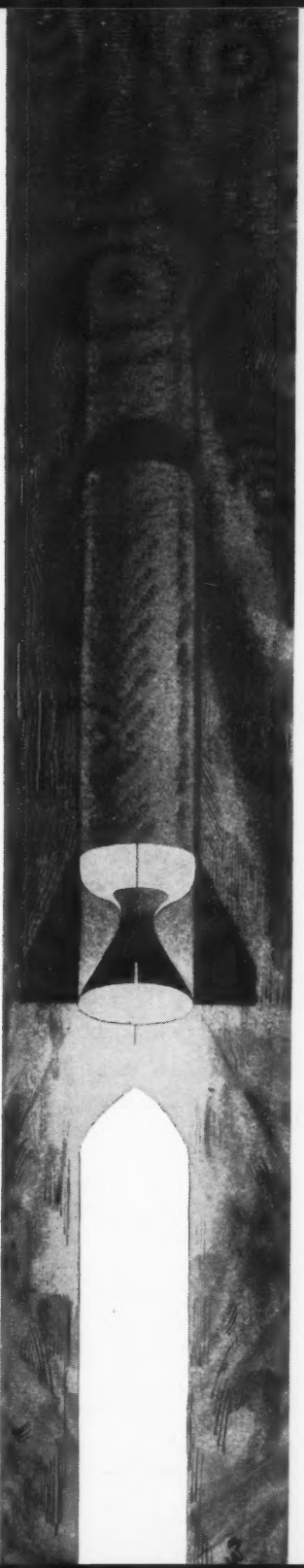
In 1950, the Rohm and Haas Company, also under Army sponsorship, entered the field, contributing fundamental knowledge on rocket motor operation and the means for developing new high energy solid propellants. Other contractors, not retained on a long-term basis, also have made significant contributions. Picatinny Arsenal contributed primarily to the improvement of double-base composition for use in various weapons applications. Finally Redstone Arsenal provided careful technical supervision of this team of contractors as well as original investigations which supplemented the team effort. The combined efforts of this team have produced outstanding results to date; and the Army expects that these contributions will continue.

WHEN rockets were first developed as really practical military weapons during World War II, rocket engines were powered by double-base solid propellants which were essentially the best cannon propellants available at the time. But the simple perforated, short cylindrical grains for cannon propellant were not adaptable to rocket use.

The rocket propellant charges presented new problems since the

DR. RALPH C. SWANN is Acting Deputy Director of Ordnance Missile Laboratories, Army Rocket and Guided Missile Agency, Redstone Arsenal, Alabama.

ocket Engines



burning surface to charge-weight ratio had to be drastically reduced. This meant that means to form a charge in a large, single piece and with more complex geometry had to be developed. Moreover, the compositions had to be changed somewhat to produce a slower and more uniform combustion. The resulting new compositions were double-bases also and still closely akin to the cannon propellants. All these were developed under direction of the Office of Scientific Research and Development.

LIMITING FACTORS

EVEN though the early double-base rocket propellants were successful, they had certain limitations. Chief of these was the low power output per pound of motor which was chiefly due to low propellant content. Furthermore, double-base grains were difficult to manufacture free of cracks and air bubbles which, coupled with their brittleness at low temperatures, occasionally caused the motor to explode when a firing was attempted.

An explosion occurred when the total surface of the grain due to shattering became so large that a

large increase in combustion pressure resulted. In other words, the rocket was subjected to pressures typical in cannon (50,000 pounds per square inch and upward), but the rocket itself was designed for much lower pressures (about 1,000 pounds per square inch).

This lower design pressure for rockets is necessary because the pressure-containing vessel is a part of the flying vehicle; hence its weight must be as small as practicable. Effect of the inert weight of the rocket on the maximum velocity, attained at the instant that the propellant is completely burned, is described by the following equation (assuming no drag and no gravitational field):

Equation 1

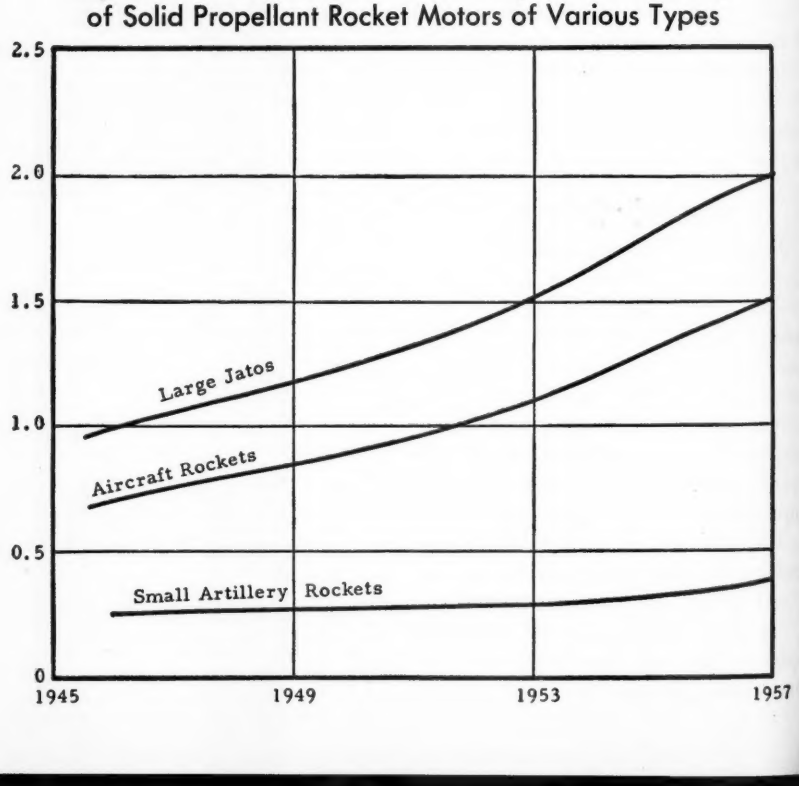
$$V_b = V_E \ln \frac{m_o}{m_b}$$

where V_b is velocity at propellant burnout, V_E is the characteristic exhaust velocity of the propellant determined from thermodynamic considerations, m_o is the mass of the rocket at launching and m_b is the mass of the rocket after the propellant is completely burned.

NOT ONLY were early rockets limited as regards low temperature operation but also in terms of size. Propellant charges were formed by extrusion at pressures up to 4000 pounds per square inch. This required large and costly presses, the largest of which could produce a

FIGURE 1.

Improvement of Relative Power Output Per Pound (I_o) of Solid Propellant Rocket Motors of Various Types



grain about six inches in diameter. Larger charges could be made only by employing several grains.

Recognizing all of these limitations in the then current rocket propellants, the Army set up an extensive research and development program to overcome them. Required was a propellant which could be mixed and cast in a fluid state, and then converted to a solid grain bonded to the inside of the case. The solid would have to be elastomeric in nature so that it could stretch or yield under load without cracking, even at temperatures as low as —65° Fahrenheit. In 1949, the scope of the Army solid propellant research and development program at Redstone Arsenal was greatly expanded, partly to exploit the results already obtained at Jet Propulsion Laboratory.

PROPELLANTS of the desired type, first demonstrated by the Army, are called composites because they are heterogeneous in nature. They consist of a discrete crystalline oxidizer phase bound together by an elastomer which is the fuel. The principal advantage to this class of propellants is that a larger quantity of propellant can be placed in a motor of a given size. Thus, the mass ratio is improved, and there is a significant increase in the power output from a given motor. Furthermore, the casting technique permits manufacture of much larger motors, which also permits increased power.

The increased power output per unit weight of motor can be illustrated by plotting that parameter over the years from 1945 to date.

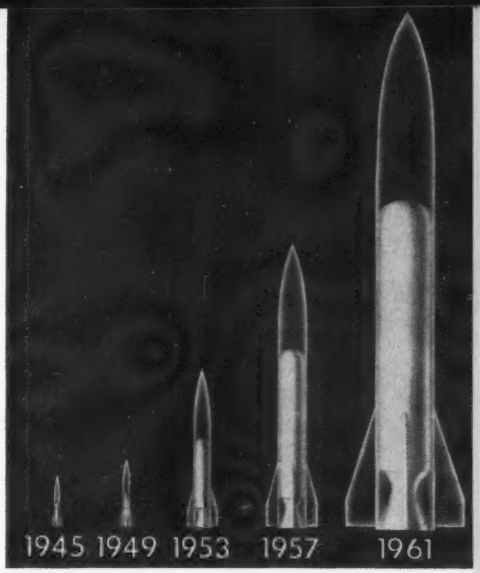


FIGURE 2.

Growth in Maximum Size of Solid Propellant Rocket Motors

(See Figure 1.) It is noteworthy that a continuous improvement has been obtained amounting to about 100 percent. In other words, efficiency has been doubled, due principally to the increased mass ratio obtained.

Over a span of twelve years there has also been a significant growth in total power available in a single package. *(See Figure 2.)* This growth amounts to a factor of 50. On a purely theoretical basis, a further growth of several orders of magnitude is possible.

Throughout all these developments, the Army has led the way and now the other military services are working with composite propellants also.

SOLID PROPELLANTS AND THE FUTURE

IN THE historical sense, solid propellants preceded liquid propellants, but with the advent of large, long-range guided missiles and rocket motors in manned air-

"Although no ideal solid propellant exists, those which do exist are excellent in most respects. To be sure, there are many areas remaining in which research and development effort can be profitably employed, but there are no large, basic problems except one — namely, the continued requirement for increasing the energy content per unit mass of propellant."

craft, liquid propellants began to be used. Initially, it was much easier to build a large tank and pump in liquid propellants than to form a large solid propellant charge.

Today, however, single solid propellant charges weighing several tons are being fabricated. The big missiles such as Redstone and Jupiter carry a considerably larger quantity of liquid propellants. Where the necessity for such huge quantities of propellant does not exist, solid propellants offer certain advantages, particularly in field handling of the weapon.

IN the case of a solid propellant unit, the mixing, loading, and the equivalent of pumping propellant from fuel tanks to combustion chamber have all been taken care of back at the manufacturing plant. Thus all that remains is to emplace the weapon and fire it.

In contrast, the field preparation for firing of a liquid propellant missile is a rather long and complex process. It involves pumping propellants, which are often quite toxic and corrosive, into the missile tanks under a condition where an ideal set-up of equipment is not always possible. Yet even when the missile is fired, the mixing and pumping to the combustion chamber must go on as a smooth, reliable process. This depends on proper functioning of lightweight mechanisms in the missile—equipments which cannot be repaired or adjusted when they fail to function properly.

The reliability of a solid propellant motor, on the other hand, can be established at a high level by quality control in the manufacturing plant.

It is an axiom of warfare that weapons must be as simple as possible to use and highly reliable; in this area, the greater reliability of solid propellant rocket motors offers a distinct advantage.

ROCKET MOTOR PRINCIPLES

AN understanding of rocket motor operating characteristics is basic to a discussion of propellants and their applications.

When reduced to its simplest elements, a rocket motor is a unit for producing thrust by jetting a mass of material at high velocity. It differs from a turbojet only in that it is completely self-contained. It is not dependent on availability of air and therefore does not contain a compressor.

Basically, the design requirements for a rocket motor are, first, the generation, at a controlled rate, of a body of gases at high temperature and pressure; and second, the exhaustion of these gases through an expanding nozzle to convert available enthalpy to velocity in the exhaust gases. This thrust is

applied to the propulsion of a vehicle which acquires a velocity proportional to the thrust and the duration of thrust application.

Thrust of a rocket, for operation at zero ambient pressure and optimum expansion, can be expressed as

Equation 2

$$F = \frac{Sr\rho}{g}\left(\frac{2\gamma}{\gamma - 1} R \frac{T_c}{M}\right) \frac{1}{2}$$

where S is the propellant burning surface, r is its burning rate, ρ is the propellant density, g is the acceleration of gravity, γ is the specific heat ratio $\frac{C_v}{C_p}$, R is the universal gas constant, T_c is the flame temperature in the chamber, and M is the average molecular weight of the exhaust gases.

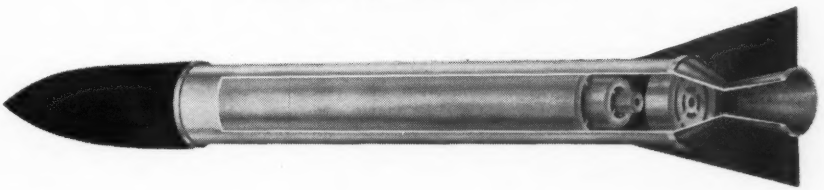
From this formula it may be concluded that combustion reactions which produce gases with low values of the specific heat ratio, low molecular weight, and high flame temperature would be good for rocket propulsion. Actually the choice is more complex.

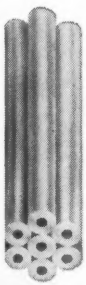
Equation 2 establishes some propellant properties. Taken together the factors S , r , and ρ determine the geometry of the charge; that is, it is possible to determine the surface required to produce the needed thrust using any specified propellant. This surface then must be provided within a cylindrical volume allotted for the motor; accordingly the design engineer must devise a charge geometry which will provide this surface.

Figure 3 shows some representative charges. Not only must the surface be specified, but also the thickness of propellant to be burned, because this establishes the burning time based on the propellant burning rate. Burning time

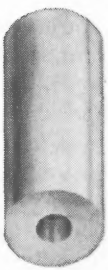
FIGURE 3.

Solid Propellant Grains

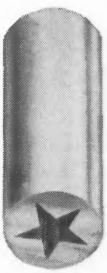




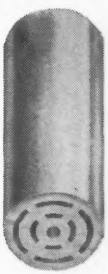
Multi-Grain



Tubular



Star Perforated



Concentric Rings

"It is an axiom of warfare that weapons must be as simple as possible to use and highly reliable; in this area, the greater reliability of solid propellant rocket motors offers a distinct advantage."

can be determined from allowable acceleration on the vehicle and desired burnt velocity.

A propellant composition is chosen by the design engineer which will burn at the proper rate and yield gases of sufficient characteristic exhaust velocity to produce the magnitude and duration of thrust required to accelerate the weapon to the design velocity. His task becomes more complex when he must decide on a specific charge geometry and on methods for retaining the charge in the motor.

ONCE a propellant charge is chosen, the nozzle must be designed. Essentially, practical rockets neither operate at zero ambient pressure nor do they provide optimum expansion of the propellant gases. For less than ideal conditions it is necessary to rewrite the equation as follows:

Equation 3

$$F = \frac{Sr\rho}{g}\left(\frac{2\gamma}{\gamma - 1} R \frac{T_c}{M}\right)^{1/2} + (P_e - P_a)\frac{A_e}{A_t}$$

where P_e is exit pressure, P_a is ambient pressure, A_e is exit area and A_t is nozzle throat area.

The nozzle is designed to expand the gases to ambient pressure if possible, but seldom is this permissible because the expansion cone would be quite large and therefore would create a large drag factor. Generally, it is specified that the major diameter of the expansion cone will be no larger than the major diameter of the rocket motor body.

For solid propellants the required nozzle throat area is determined by reference to graphs showing the value of propellant surface to nozzle throat area which corresponds to a specified chamber pressure *(See Figure 4)*. Since the chamber pressure is chosen primarily by available strength-to-weight ratios for the minimum weight chamber and the propellant surface has been determined from thrust requirements, the required nozzle throat area can be determined from these curves. A set of characteristic curves for each propellant composition is obtained by firing a number of test motors.

PROPELLANT PROBLEMS

HAVING briefly considered rocket motor design problems, let us consider the propellants themselves in somewhat more detail.

All solid propellants must have physical strength. Unrestrained, cartridge charges need tensile strength of about 1000 psi or greater. Charges restrained by bonding the outer periphery to the motor case, however, are quite different. High tensile strength and resultant low elongation are detrimental in such applications. Here low tensile strength and high elongation are needed.

The problem arises from the fact that propellants have a coefficient of thermal expansion which is 5 to 10 times higher than that of motor chamber materials; there-

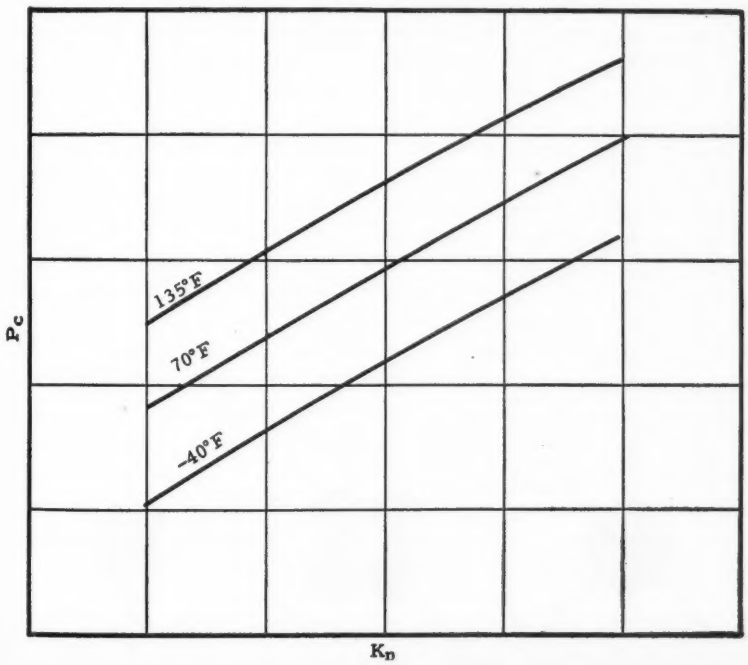
fore the propellant must be able to stretch considerably without cracking when large temperature changes are experienced. The careful selection of elastomers for composite propellants is made primarily to secure the physical properties needed for "case-bonding."

Certain ingredients in solid propellants—namely, oxidizer and fuel—have been mentioned, but these do not constitute the entire recipe. For instance, double-base propellants have a tendency to decompose when heated even slightly above room temperature and give off gaseous oxides of nitrogen. Certain chemicals which react with these oxides of nitrogen are therefore incorporated to stabilize the propellants.

"Additives"—*i.e.*, a term applied to anything which is neither oxidizer nor fuel—may be used to modify the propellant burning rate. They may be used to make propellants burn faster or slower, and to make the burning rate nearly independent of pressure or temperature. Other additives improve uniformity of combustion. Plasticizers are used to improve consolidation of the mass. In some composite propellant systems polymerization catalysts are required. Usually a polymerization inhibitor is also required to prevent the catalyst from acting too rapidly.

FIGURE 4.

Typical Variation of Chamber Pressure (P_c) With Propellant Burning Surface to Nozzle Throat Area Ratio (K_n) at Various Firing Temperatures



ALTHOUGH no ideal solid propellant exists, those which do exist are excellent in most respects. To be sure, there are many areas remaining in which research and development effort can be profitably employed, but there are no large, basic problems except one—namely, the continued requirement for increasing the energy content per unit mass of propellant.

Apparently this requirement will never be completely satisfied since new military weapons frequently depend on higher powered rocket motors than are now available.

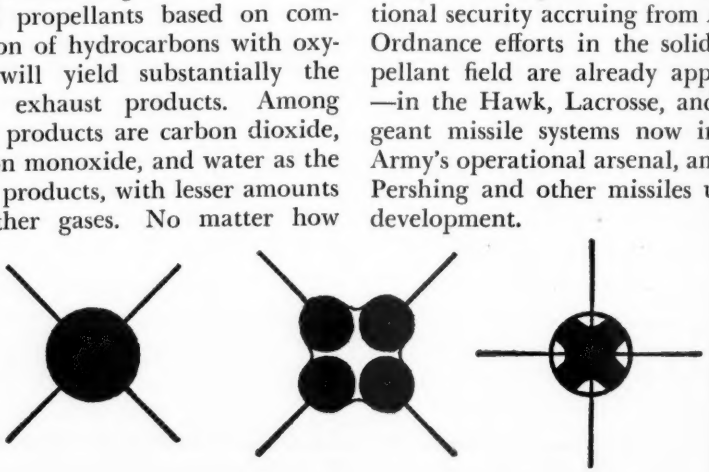
Propellants are often rated by their specific impulse (I_{sp}), which is thrust multiplied by time, or impulse, per unit weight of propellant burned. This is the same parameter as characteristic exhaust velocity *(See Equation 1)*, except that it is expressed in different units. To convert V_E to I_{sp}, it is necessary merely to divide by the acceleration of gravity. Referring again to equation 1, high specific impulse calls for low values of the specific heat ratio, high flame temperatures, and low molecular weight exhaust gases.

All propellants based on combustion of hydrocarbons with oxygen will yield substantially the same exhaust products. Among these products are carbon dioxide, carbon monoxide, and water as the chief products, with lesser amounts of other gases. No matter how these elements may have been combined in the original propellants, the thermodynamic properties of the combustion gases are substantially the same; therefore, the specific impulse turns out to be very nearly the same.

In some systems, ideal completeness of combustion is not achieved; hence, the specific impulse is somewhat low, while in other systems about 95 percent of the theoretical specific impulse can be obtained. One limiting factor is the water which decomposes endothermically at high temperatures, thus absorbing heat which otherwise could be made to do work. Obviously production of water should be avoided but that is impossible while hydrocarbons are burned in oxygen.

For the future, attempts will be made to replace hydrocarbon systems with others whose energy output is higher. It must always be kept foremost in mind that any new reactions must give gaseous products. Solids cannot be expanded to produce work.

While further refinements along these and related lines are under study, the tangible benefits to national security accruing from Army Ordnance efforts in the solid propellant field are already apparent —in the Hawk, Lacrosse, and Sergeant missile systems now in the Army's operational arsenal, and the Pershing and other missiles under development.



Achieving maximum military readiness from available resources is the goal of the Army's

Inspector General Of Logistics

Colonel A. R. Cyr

WITH completion of its first cycle of inspections some six months ago, the Office of the Logistics Inspector General has made significant strides in ensuring that activities under jurisdiction of the Deputy Chief of Staff for Logistics (DCSLOG) are achieving the greatest possible return in military readiness from the resources allocated to them.

The Office of the Logistics Inspector General is of relatively recent origin. Early in 1955, at the request of the Secretary of the Army, the Chief of Staff directed the Comptroller, assisted by the Judge Advocate General and The Inspector General, to make an exhaustive study of the Army's inspectors generals systems. One of the resulting recommendations called for the establishment of an Inspector General Section in the Office of the Deputy Chief of Staff for Logistics.

The Committee pointed out that, because the Deputy Chief of Staff for Logistics functions as a major commander with responsibilities for supervision and direction of the various Technical Services, a definite need existed for a DCSLOG staff element that had no "vested interest" in any activity —an element that could inquire into and report upon matters which pertained to the discipline, efficiency and economy of his command. Accordingly, the first Logistics Inspector General was appointed on 1 October 1956, and the first cycle of inspections was completed in February of this year.

MISSION

AS presently constituted, the Logistics Inspector General (LOG

COLONEL A. R. CYR, an Ordnance Corps officer currently detailed as Inspector General, is Logistics Inspector General, Office of the Deputy Chief of Staff for Logistics, Department of the Army.

IG) reports directly to the Deputy Chief of Staff for Logistics, serving him as confidential agent in the inspection, investigation, and evaluation, of matters relating to the economy and efficiency of activities under his direction and control. The LOG IG mission encompasses the following four major responsibilities:

1. Performs annual general and special inspections of the Office of the Chiefs of Technical Services as well as field activities which are under the control and direction of DCSLOG.

2. Conducts inquiries and investigations as directed by the Deputy Chief of Staff for Logistics.

3. Conducts a field program of special inspection of Army procurement administration.

4. Supervises and coordinates IG matters in the Office of the Deputy Chief of Staff for Logistics and the Technical Services within the basic policies of the Inspector General, Department of the Army.

CONCEPTS

IN carrying out these multiple missions, the Program of the Deputy Chief of Staff for Logistics has been used as a point of departure in developing general concepts. Budgetary considerations, it is recognized, will continue to be a limiting factor in the Army's quality and size, with restrictions becoming progressively more severe because of increasing costs of modern weapons. Economy and efficiency of the mission performance of the Technical Services and DCSLOG Class II activities are therefore of paramount concern.

In every phase of operations, LOG IG's major guideline is to insure that inspected activities are getting the greatest possible return in the way of military readiness from their allocated resources.

SINCE such a large portion of the Army's total budget is spent in the operation of the seven Technical Services and their procurement work, the headquarters of the Technical Services must receive close attention as they relate to mission performance.

From an inspector's view, any overall comparison of one Technical Service with another must be made in general terms of reference, because of the differences in their primary functions. Nevertheless there are large areas that do lend themselves to uniformity. In line with the DCSLOG objective of "integrating and giving pattern to the system of the seven Technical Services," the Logistics Inspector General will seek out those areas where uniformity would be advantageous. It should be pointed out, however, that uniformity for its own sake is not part of the DCSLOG objective.

The Logistics Inspector General must also concentrate on adequacy and effectiveness of the inspection systems of the various services to make certain that subordinate commands are being properly inspected and evaluated. This involves a continuous review to verify that no gaps exist and that responsibilities for conducting inspections are clearly defined and thoroughly understood. These evaluations have as their focal point the overall DCSLOG program.

Excepting procurement, LOG IG inspection activity is normally

limited to the headquarters of the Technical Services and DCSLOG Class II activities.* At the same time, subordinate elements of the Technical Services are tested to discover areas of weakness and sensitivity in the overall administration of the Technical Services.

In the area of procurement inspection particularly, some degree of standardization of the Technical Service IG systems is desirable. Although admittedly difficult of attainment, this is a major long-term goal. Strict compliance with the written word merely for the sake of conformity is not as important as whether the actions in question are sensible, within stated policy. The unorthodox can and should be expected under the sense of urgency existing today—yet all actions must be legal and proper within the intended spirit of law and regulation.

As the Army makes progress in reorganizing along pentomic lines, the evolutionary steps place continually added stress and add responsibilities on the Chiefs of the Technical Services and DCSLOG Class II activities. Thorough preplanning prior to inspections can materially assist in minimizing time in areas that warrant only a corroborative check, thereby providing more time in areas that are apt to be more susceptible to improvement. Inspectors can assist by seeking out directives that appear to have an excessive and restrictive degree of control over subordinate elements and which rob them of initiative and authority.

"Strict compliance with the written word merely for the sake of conformity is not as important as whether the actions in question are sensible, within stated policy. The unorthodox can and should be expected under the sense of urgency existing today—yet all actions must be legal and proper within the intended spirit of law and regulation."

PERSONNEL

TO maintain standards and implement the tasks faced by the inspector general, it is obvious that high type personnel is required. Equally obvious is the fact that it is difficult to find such personnel when they are in demand by every element of the Army.

All nominations for detail of an Inspector General in a Technical Service or DCSLOG Class II activity are monitored for adherence to the minimum criteria of the Inspector General, Department of the Army, as set forth in Paragraph 13 c (4) AR 614-100. Nominations then are submitted to the Inspector General, Department of the Army, for final approval. Effort is made to maintain a proper balance of experience among LOG IG personnel so that distinctions and complexities of each of the seven Technical Services are represented.

Training is accomplished by assignment when possible to the three-week school of the Inspector General, Department of the Army; to the sixteen-week Supply Management Course at the Army Logis-

*DCSLOG Class II activities include three oversea supply agencies, the Army Logistics Management Center at Fort Lee, Virginia, and the Army Maintenance Board at Fort Knox, Kentucky.

tics Management Center at Fort Lee, Virginia; or to the eight-week Army Procurement Management Course at the same Center. On-the-job training and periodic informal seminars also are conducted.

ORGANIZATION

OPERATIONALLY the LOG IG is organized into three branches —investigations and complaints; inspections; and procurement inspection.

Investigations and Complaints Branch. The title explains the functions, which are essentially the same wherever performed.

No formal investigation can be conducted unless it is directed by proper authority. In this instance such authority is the Deputy Chief of Staff for Logistics. Investigations are conducted to provide the appropriate directing authority with facts to form a sound basis for just and intelligent action whenever there is doubt or allegations of wrong-doing, inefficiency or maladministration. Because the Commander's action in such matters may hinge on the soundness of the conclusions reached by the investigating officer and the recommendations based thereon, it is imperative that each investigation be complete, factual, fair to everybody, and that the resulting conclusions and recommendations be based upon clearly established facts. Conduct of complaints and investigations is decentralized to the lowest echelon possible.

In the area of complaints, the inspector general has always been a medium through which military personnel have been able to submit complaints and state their grievances. This is important as a command tool to improve efficiency and morale.

Inspections Branch. This branch is charged with making annual general inspections of the seven Technical Services and of the five Class II activities which report directly to DCSLOG. These services and activities have been inspected by this branch on a cyclic basis for the first time. Scope of the inspections is comprehensive, aimed at providing DCSLOG with an independent appraisal of the overall efficiency of mission performance by each activity.

In keeping with previously mentioned general concepts, "soft spots" are identified by careful preplanning. Major attention then is devoted to these areas. Emphasis is directed at examining methods of control and evaluation of mission performance. The inspection seeks to determine causes of failure and to develop recommended solutions for improvement.

Procurement Inspection Branch. This branch maintains field offices at New York, Chicago and San Francisco, with each exercising responsibility for procurement inspection in their respective geographic areas.

Initially, procurement inspection activity was taken over from the Inspector General, Department of the Army, which had started such inspection activities as a result of rapid increase in procurement during the Korean War. These Department of the Army inspections had as their objective the examination of a sampling of all contracts to check on, and to strengthen, the inspection efforts of the Technical Services.

Actual inspections today are con-

ducted through the three field offices, which include within their areas of responsibility more than 200 field installations and activities of the Technical Services—Engineer, Chemical and Ordnance Districts, Commands, arsenals, market centers, supply agencies, hospitals, and depots.

Experience in this field indicated a need for broadening the approach, from essentially a detailed inspection of selected contracts, to a more complete examination of procurement administration generally. Accordingly the scope of inspections now embraces an examination of policies, procedures, command supervision, and operation of activities engaged in the award and administration of procurement contracts. In addition, adequacy and effectiveness of Technical Service procurement inspection programs are included.

Particularly important is the objective to encourage establishment of performance standards to enable a better and more precise evaluation of work performed. Present plans are to inspect each Technical Service field activity which has a procurement mission. Following the first complete cycle, only the major purchasing activities will be inspected annually, and the others at less frequent intervals. This will allow more time to support the other inspection and investigative responsibilities of the Logistics Inspector General.

"In every phase of operations, LOG IG's major guideline is to insure that inspected activities are getting the greatest possible return in the way of military readiness from the resources allocated to them."

FOR THE future, the Logistics Inspector General's dominant guideline will be to seek ways in which activities can be improved through inspections. Areas of uniformity within the operations of the Technical Services—as well as within their IG systems—will be sought. High standards will continue to be required for those entering the system in order to maintain the trust, confidence and prestige so essential to superior performance. Operating policy will focus attention on the job itself; and it will unremittingly endeavor to promote the cooperation of operator and inspector, directing their efforts toward the common goal of improved performance.

NEW PAMPHLET ON ARMY MISSILES

COMPILATION of latest information about "Army Missiles and Rockets" is contained in Department of the Army Pamphlet 353-13. Although prepared primarily for Army members, it is available to the public for 30 cents from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

The pamphlet is divided into two sections—the first covering surface-to-surface weapons, the second surface-to-air. Included are illustrations and brief descriptions of Jupiter, Redstone, Jupiter "C", Sergeant, Corporal, Honest John, Little John, Lacrosse, Dart, Nike-Ajax, Nike-Hercules, Hawk, Talos, Nike-Zeus. A glossary of terms is included.

More on "Project 200" which provides

REGULAR ARMY COMMISSIONS FOR SCIENCE SPECIALISTS

WITH the offer of appointment in the Regular Army to 28 candidates under "Project 200," the Army's pool of officer scientific talent will have been augmented in a score of critical fields.

Project 200 was the name of the Army program to obtain 200 specialists in twenty critical scientific fields. The program was conducted as an adjunct to the Armed Forces Regular Officer Augmentation Act of 1956.

Recognizing the Army's need for scientifically trained officers, the Congress incorporated a provision in the Augmentation Act permitting the Army to obtain from all sources, both military and civilian, up to 200 Regular Army officers qualified in critical fields

After careful review of all applications, the Regular Army Specialist Appointment Board recommended acceptance of 28 applicants. Of these, four have doctor's degrees, 21 have master's, and three have bachelor degrees in the twenty recognized critical scientific fields. In every case academic background and experience were determined to be outstanding.

The following grades were recommended for the appointees:

PERMANENT

Maj	Capt	1st Lt	2d Lt	Total
1	7	9	11	28

TEMPORARY

Lt Col	Maj	Capt	1st Lt	Total
3	5	12	8	28

Typical of the applicants selected is a young graduate of Massachusetts Institute of Technology with B.S. and M.S. degrees in electrical engineering. Employed as a technical assistant from 1954 to 1957, he is presently serving on active duty as an officer.

Another selected applicant is a graduate of Louisiana State University with a B.S. degree in chemical engineering, an M.S. degree in microbiology from the University of Florida, and a Ph.D. degree in bacteriology from the University of Kentucky. Since 1956, he has been employed at the U. S. Army Chemical Research and Development Command as a supervisory chemical engineer.

TO KEEP pace with advancing technology, the Army requires officers who are militarily trained but who also have sufficient advanced training in scientific fields to recognize and cope with problems related to their military duties. These officers must be capable of working with civilian scientists, translating military requirements into scientific terms and directing research and development in military fields.

Project 200 officers will be utilized primarily in their particular specialty area. However, other type assignments, either branch material or branch immaterial, will be given to provide each officer with sufficient military background

to insure effective utilization in his specialty area.

Under this program, selectees fall into three categories—those with no military status; those now serving on active duty; and those holding reserve commissions but not on active duty.

A qualified individual appointed directly from civil life with little or no previous military experience will attend a basic course, either of the branch to which he is assigned or in one of the combat arms. This will prepare him to assume his role as an Army officer.

Specialists with previous experience currently not on active duty but who have already attended a basic or branch career school may be sent immediately to an appropriate school for refresher training. If the officer is on active duty, he probably will not be required to attend a school initially on appointment in the Regular Army. His future schooling will depend upon the career needs and the requirements in his specialty.

All officers commissioned under this program, even though in grade of lieutenant, will be exempted from a combat arms detail prescribed for newly commissioned Regular Army officers. They will be afforded equal opportunity with all other Regular Army officers to attend career schools to include the senior service colleges.

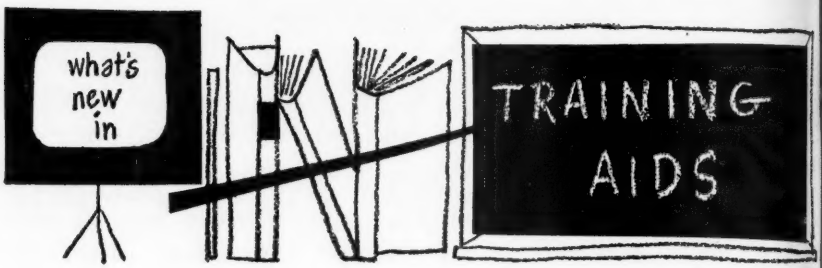
Officer Assignment Division, the Adjutant General's Office, will exercise centralized monitorship over the specialists, even though the branch to which they are assigned will maintain their records. Since the majority of positions in which Project 200 officers can best be utilized are in the continental United States, rotation overseas is not presently planned. Beginning with the 21st year of service, they may be assigned continuously in their specialty area. Those desiring specialization in Research and Development, and in the Atomic Energy Program, may volunteer.

Educational Briefs

QUALIFIED retired Army personnel and those soon to be retired are being encouraged to consider the teaching profession under a plan recently announced by Secretary of the Army Wilber M. Brucker. Individuals who have baccalaureate degrees and special competency in at least one "core subject"—science, physics, mathematics, history, language—will be urged to prepare themselves for teaching careers in high schools and colleges. A name and credential file will be maintained by the office of The Adjutant General, which will serve as a referral agency for individuals and educational institutions. Major Army commanders will cooperate in the program.

The new plan was evolved in response to an appeal by the President's Committee for help in recruiting high quality personnel for the teaching profession as a matter of national urgency. Military personnel were mentioned by the committee as "an untapped resource" of competent teachers.

ENLISTED personnel qualified as potential instructors are being encouraged to make application for such assignment under provisions of AR 611-214. Qualified personnel with two years' active service who have completed a tour of foreign service since January 1950 are regarded as especially desirable, and will not be subjected to oversea levies by virtue of provisions of paragraph 15*d*, AR 614-30.



Keep your organization current with the latest training materials by referring to this section in each issue.

TRAINING LITERATURE

While the following new literature will be published shortly, units are cautioned *NOT* to requisition copies until receipt of automatic initial distribution or the items are listed in DA Pamphlets 310-1, 310-3, or 310-4.

US Army Chemical, Biological and Radiological (CBR) Intelligence (U). FM 3-130 covers doctrines and procedures for Chemical Corps intelligence activities, including Chemical Corps responsibilities in production of technical intelligence. It provides the staff chemical officer with a guide to implementation of technical intelligence responsibilities.

Harbor Craft Engineman's Handbook. TM 55-509 covers principles of operation and maintenance of typical diesel propulsion plants, auxiliary engines, machinery, and related equipment for enginemen on board vessels of the Transportation Corps Fleet. It may also be used as a reference by personnel training replacements for harbor craft units.

Dan Patch Mechanical Mine Layer. TC 5-( ) will provide information guidance on antitank mine planting procedures employing the Dan Patch Mechanical Mine Layer. The publication covers mine-handling procedures, mine laying methods, and related information necessary for proper use of the machine.

Handbook for Aircraft Accident Investigators. DA Pamphlet 1-( ) prescribes and standardizes procedures designed to assist those who are charged with the responsibility of conducting aircraft accident investigations.

Revisions scheduled for publication:

FM 23-82, "106mm Rifle"—a revision of the 1955 edition.

DA Pamphlet 44-2, "NIKE Handbook (U)"—a revision of the 1957 edition.

TRAINING AIDS

Training Films recently released:

TF 3-2594, "Nerve Gases—Part II—Use of Injection Instruments"

TF 9-2549, "Cold Weather Operation—Automotive Winterization Equipment"

TF 9-2583, "Lubrication of Military Vehicles"

TF 30-1891, "Security—Part II—Safeguarding Defense Information"

TF 46-2554, "Helicopter Orientation—Introduction to Helicopters"

TF 55-2574, "Installation of the Main Landing Gear, L-23"

TF 55-2575, "Removal of the Main Landing Gear, L-23"

TF 55-2576, "Installation of the L-23 Outer Wing Panel"

TF 55-2577, "Removal of the L-23 Outer Wing Panel"

TF 55-2578, "Removal of Nose Gear L-23"

MF 16-8922, "Baragoi—An Outpost of Faith"

MF 20-8935, "Dehumidified Storage"

MF 44-8852, "NIKE—For Defense of America"

AFIF 225, "I&E Sportsreel"

PMF 5319, "Management of Burns, Part II—Local Care"

ARMY EXTENSION COURSES

New Subcourses recently published:

Field Artillery Rockets and Missiles, Arty Subcourse 74, US Army Artillery and Missile School. Introduction to modern field artillery rockets and guided missiles, including general principles of guidance and launching systems, methods of propulsion, principles governing tactical employment and gunnery aspects of Honest John rocket and Corporal missile.

The Field Artillery Forward Observer, Arty Subcourse 8, US Army Artillery and Missile School. Organization of field artillery for-

ward observer section and role of the forward observer in the combined arms team, including the establishment of forward observation, target acquisition, reports, fire planning, and coordination with the supported unit.

Mapping and Map Supply II, Engr Subcourse 324, US Army Engineer School. Organization for mapping in Department of Defense; planning, coordination, and execution of a military mapping operation; planning map requirements and map distribution.

Financial Inventory Accounting, Finance Subcourse 41, US Army Finance School. Basic concepts, principles, and procedures of financial inventory accounting at the installation level. Operations at depots, command headquarters and DA are covered only insofar as they contribute to an understanding of the overall system.

Military Comptrollership, Subcourse 91, US Army Finance School. Background, concept, functions, and responsibilities of military comptrollership; nature, scope and diversity of management problems in the Army; concepts and elements of the Command Management System. Also included are service aspects of the comptroller's job; history and development of comptrollership; organization of a comptrollers' office at major command and installation level.

Administration and Personnel Management I, Subcourse 12, Army Medical Service School. Orientation on Army hospital organization; basic procedures in administration and personnel management; military correspondence, morning reports; introduction to military and civilian personnel management; food service program; introduction to human relations and problem solving.

Training Management. Subcourse 37, Army Medical Service School. Principles of training methods; mechanism of instruction; company training programs and schedules; estimate of the training situation; planning training for an evacuation hospital.

Vessel Terms, Structure, and Classification. Subcourse 69, US Army Transportation School. Nautical terms of direction and location; lines of form; ship's structure; measurements, including dimensions, capacity, tonnages, load lines, and draft marks; vessel classification by type of service; structural design; and Maritime Administration classification system.

Revisions recently published include:

Utilities I. Engr Subcourse 240, US Army Engineer School. Revision of 1954 edition.

Orientation to Army Dental Service. Subcourse 3, Army Medical Service School. Revision of the 1957 edition.

Signal Orders. Subcourse 13, US Army Signal School. Revision of 1954 edition.

Field Engineering. Common Subcourse 22, US Army Infantry School. Revision of 1953 edition.

Civilian Personnel Management. Common Subcourse 47, The Adjutant General School, US Army. Revision of 1952 edition.

Effective Army Writing. Common Subcourse 58, The Adjutant General School, US Army. Revision of 1956 edition.

Technical Training in Nuclear Power

A THIRD cycle of training for Army nuclear power plant operating personnel will begin on or about 15 January 1959. Instruction will be given to enlisted men to meet immediate requirements for nuclear power plant operators and maintenance personnel. Academic training will include a six-month basic course at Fort Belvoir, Virginia, followed by a six-month operational training period on the Army Package Power Reactor at Fort Belvoir or at the Argonne Low Power Reactor at Idaho Falls, Idaho. Selection criteria are spelled out in Department of the Army Circular 621-18.

A CLOSED circuit television system which enables students to observe intricate maintenance functions or equipment operation in other parts of the plant has been installed at the Army Package Power Reactor, Fort Belvoir, Virginia. Pick-up cameras can monitor any operation, thus permitting large groups to observe procedures in small areas such as the restricted work space inside the "vapor container." The equipment was designed and built by the Dage Corporation for Alco Products, Inc., the Atomic Energy Commission's prime contractor for the reactor.

PARAGRAPHS from the Pentagon and the Field

Infantry OCS Hall of Fame

Renowned graduates of the Infantry Officer Candidate School will be honored in a new Hall of Fame, recently dedicated at the United States Army Infantry School, Fort Benning, Georgia. Graduates who have distinguished themselves in civilian endeavors as well as in the military field will be honored. Named Wigle Hall in honor of the late Lieutenant Thomas W. Wigle who in 1945 distinguished himself in combat in Italy, the building will house a Medal of Honor Room. Portraits of OCS graduates who were awarded the Nation's highest honor will be displayed there. A picture gallery of other eminent graduates also will be maintained.

Bibliography on Missiles

A comprehensive bibliography entitled *Missiles, Rockets, and Satellites* has been published by the Army Library, covering books, magazine articles and other publications in this area. Published in five volumes as DA Pamphlet 70-5-1-2-3-4-5, the bibliography went into distribution in mid-July. Volume I covers material published on the Soviet Union; Volume II, the United States; Volume III, Great Britain, France and other Free Countries; Volume IV, Technology: Means and Methods; Volume V, Earth Satellites and Space Exploration.

USAFI Changes

The fee for individual enrollment in USAFI correspondence courses is $5, effective 1 July, although all other policies and procedures will be maintained as in the past. The new fee does not apply to elementary and spoken language courses for which there will be no enrollment charge. Enrollment in self-teaching courses has been discontinued. Details are covered in DA Circular 621-17.

Military Pay Act of 1958

Details of the Military Pay Act of 1958, which became effective 1 June, are contained in Department of the Army Circular 35-52. The Act revises monthly rates of basic pay and establishes pay grades O-9 (Lieutenant General) and O-10 (General) for officers, and pay grades E-8 and E-9 for enlisted members.

Major purpose of the law is to provide a military pay system designed to attract and retain qualified personnel for active career service. Generally, all military personnel with more than two years service receive an increase of at least six percent. Provision is made for graduated increases resulting in highest increases for the upper officer and enlisted grades, thus increasing career opportunities.

Two proficiency pay systems are set up. The first would authorize advancement of an enlisted man to any enlisted pay grade when he possesses special proficiency in a military skill. Thus he would receive pay, allowances and special or incentive pays of the higher pay grade.

Alternative is a system that sets up proficiency ratings of P-1, P-2 and P-3 with maximum monthly rates of $50, $100, and $150 respectively. These amounts would be over and above the basic pay and any other special or incentive pays to which the individual might be entitled.

The longevity pay system is modified by eliminating increases beyond normal promotion points, thus altering the former emphasis on total service rather than on ability. In this area, significant pay amounts are provided earlier in the individual's career to create added incentive for achievement.

For the first time also the new system establishes on a permissive basis a special pay for a small percentage of officers holding critical positions of unusual responsibility. Eligible assignments may include command, staff or any other position, to provide additional amounts of $50, $100, and $150 depending upon rank and grade.

High Scoring Marksmen

Marking up the highest score ever recorded, Sergeant Herbert Duncan established a new official record and also won the high new shooter award for the rifle in the 1958 U. S. Army Rifle and Pistol Championships, held at Fort Benning, Georgia. He made a mark of 979-102VS out of a possible 1,000 points. Another Third Army soldier, Master Sergeant James W. Kurtz, won the pistol event with a score of 2586-78X.

Special Warfare Transferred

The Office of the Chief of Special Warfare has been discontinued and all of its assigned functions, personnel, funds, files and equipment have been transferred to the newly created Office of the Director of Special Warfare as an organizational element of the Office of the Deputy Chief of Staff for Military Operations.

Survivors' Guide

Department of the Army Pamphlet 608-4 has been published as a guide for survivors of Army personnel who die while on active duty. Besides outlining the Army Assistance Program for families or next-of-kin, it covers duties of the Survivor Assistance Officer, and various benefits, rights, privileges due survivors.

Entertainment Contest

Effective with calendar year 1959, the All-Army Entertainment Contest will be established as a recurring annual program. The contest is designed to furnish troop entertainment at all echelons, stimulate participation in off-duty entertainment activities, promote soldier shows and music, provide additional public and community relations outlets, ascertain the most outstanding Army talent for radio and television programs and recruiting films, and provide high caliber military entertainers for the touring soldier show, "Rolling Along."

As provided in AR 28-10, the Irving Berlin Trophy will be awarded each year to the area level command scoring the greatest total points in the combined "recorded" and "live" phases of the grand finals. In this year's finals conducted in June at Fort Belvoir, Virginia, the trophy was awarded to First United States Army. Secretary of the Army Wilber M. Brucker made the presentation.

Summer Training

Some 5,440 company-size units, both divisional and non-divisional, participated in this year's Army Reserve annual unit training program. Summer training began for an estimated 246,000 Reservists in June and continued through August.

High Accuracy Grids

Now undergoing service tests, a cartographic grid-ruling instrument capable of producing highly accurate rectangular grids has been developed by the Engineer Research and Development Laboratories, Fort Belvoir, Virginia. The new instrument is suitable for field use in compiling maps. Simple in design and operation, it is expected to lead to a reduction in levels of skill and experience required in drafting phases of mapping.

Solar Powered Battery

Army-developed solar converters provide power for one of the two tiny radio transmitters in the Vanguard satellite. High intensity sunlight of outer space is converted to electricity by 108 solar converters grouped in six clusters placed around the surface of the small sphere. They provide power for a tiny minitrack transmitter which sends out a signal enabling ground stations to track it, determine altitude, orbit and skin temperatures. Engineers at the Signal Engineering Laboratories, Fort Monmouth, New Jersey, have demonstrated that solar converters are the ideal power source for the satellite, since they will produce electricity indefinitely.

ICBM Site

The Corps of Engineers is acting as construction agency for two Intercontinental Ballistic Missile sites for Strategic Air Command. One is to be built in the area of Offutt Air Force Base, Omaha; the other in the Fairchild AFB, Washington area. Estimated total cost: $25 million.

Painless Dental Injection

Development of a new device for giving painless dental injections was recently announced by the Army Medical Service. In doing away with the needle in administering anesthetic for routine dental operations and surgery, Army medical research-

ers are making the first basic change in the injection method in the history of dentistry. The new experimental injector shoots the anesthetic into the tissues at a speed of about 700 feet per second. In addition to eliminating any pain, the new method of anesthetizing eliminates the hazards of needle fracture during injection and reduces the danger of transmitting infectious hepatitis. Preliminary reports on the performance of the new jet injector indicate that tomorrow's soldier will be receiving painless, safer dental injection of anesthesia.

Improved Arctic Sled Units

Undergoing tests on the Greenland Icecap are three new and improved sled-mounted shelters—called wanigans—developed for personnel aboard tractor-drawn snow trains in frigid climates. The three units in the new family are a 24-man bunk or mess wanigan; a 12-man bunk or mess unit; and a small four-man reconnaissance unit. They can be dissassembled completely or partially with equipment intact. The units were developed by the U. S. Army Engineer Research and Development Laboratories at Fort Belvoir, Virginia, for Transportation Corps use.

Missile Student Enrollment

With some 1,300 students taking one or more of 40 courses offered in various phases of Army and Air Force guided missiles and rockets, the "Space Age University" at Huntsville, Alabama, is the third largest educational institution in Alabama. The school actually is the Army Ordnance Guided Missile School now with a "campus" of 87 buildings. Only the University of Alabama and the Alabama Polytechnic Institute at Auburn exceed the school in number of students and faculty.

Chemical Contract Orders

The U. S. Army Chemical Corps has distributed a booklet to assist Government personnel using Delivery Orders against U. S. Army Chemical Corps open-end contracts for commercial chemicals. Copies of the booklet have been sent to Departments of Army, Air Force, Navy and Marine Corps installations and activities.

The booklet contains information on How To Order, Individual Extracts, Inspection and Acceptance, and Supply.

Additional copies of Open-End Contract Extracts may be obtained from the Commanding Officer, U. S. Army Chemical Procurement District, New York, 29 Broadway, New York 7, New York.

For Faster Combat Communications

Super-Speed Teletypewriter

FIRST in a new family of super-speed combat teletypewriter units, the world's fastest message printer and code puncher has been developed for the Army Signal Corps.

Capable of pounding out messages at 750 words a minute, the new equipment is ten times faster than standard teletypewriter equipment, five times faster than normal conversation, and twelve times as fast as the average typist can set down letters with a typewriter. As part of a combat communications center, it will rush messages to widely dispersed mobile command posts.

The device has no ordinary typing keys; instead a wheel rimmed with letters spinning at 3,750 revolutions a minute punches out coded holes. Punched tape spews from the device at more than seven inches a second. The high speed is made possible by a tiny hammer that slaps the paper against the type wheel—a major breakthrough in mechanical printing.

UTILIZING the new machine, warnings and information on enemy movements could move rapidly and accurately to friendly units widely dispersed under nuclear battlefield conditions. The printer can be mounted on a radio-equipped jeep or truck teamed to a mobile forward area communications center. The entire center can be swiftly moved to a new location.

The printer-puncher also could be used to feed battle information into a new mobile combat computer which is under development. This electronic "brain" would evaluate tactical information and decide swiftly on priority targets.

Although similar to existing systems used by news services, the new teletypewriter is much faster. In future commercial use, the device could speed transmission of telegrams, stock market quotations and weather reports. It also has important applications in the field of integrated data processing. The device was developed for the Signal Corps by Kleinschmidt Laboratories, Inc., a subsidiary of Smith-Corona.

(For view of the high-speed teletypewriter in field use, as part of a unified mobile communications center, see back cover.)

THE U. S. ARMY—A KEY TO PEACE